FEBRUARY, 1938

Railway Engineering and Maintenance

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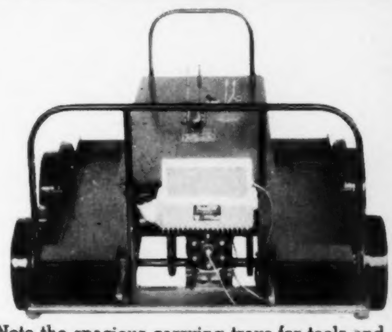
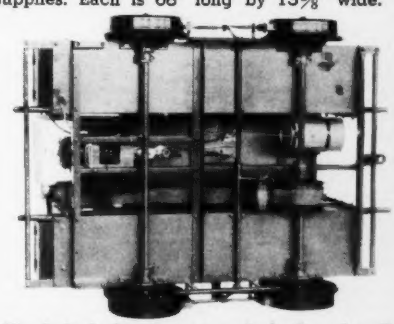
● The Fairmont M14 Series E steel frame car can carry economically a net load of 1,200 lbs.—sufficient for a crew of 6 or 8 men. It can pull a car loaded with 2 men and 3,000 lbs. net load up a ½% grade at 24 miles per hour. Because there is a large reserve of power available, the Fairmont 5-8 H.P. OD engine lasts longer, reducing maintenance expense. 4-wheel brakes, extension lift handles for quick removal from track, and sturdy guard rails front and rear make the M14 Series E one of the safest cars ever used in section work. Rear lift is 105 lbs. Write for bulletin 330B for full details. Fairmont Railway Motors, Inc., Fairmont, Minnesota.



Note the spacious carrying trays for tools and supplies. Each is 68" long by 13⅝" wide.

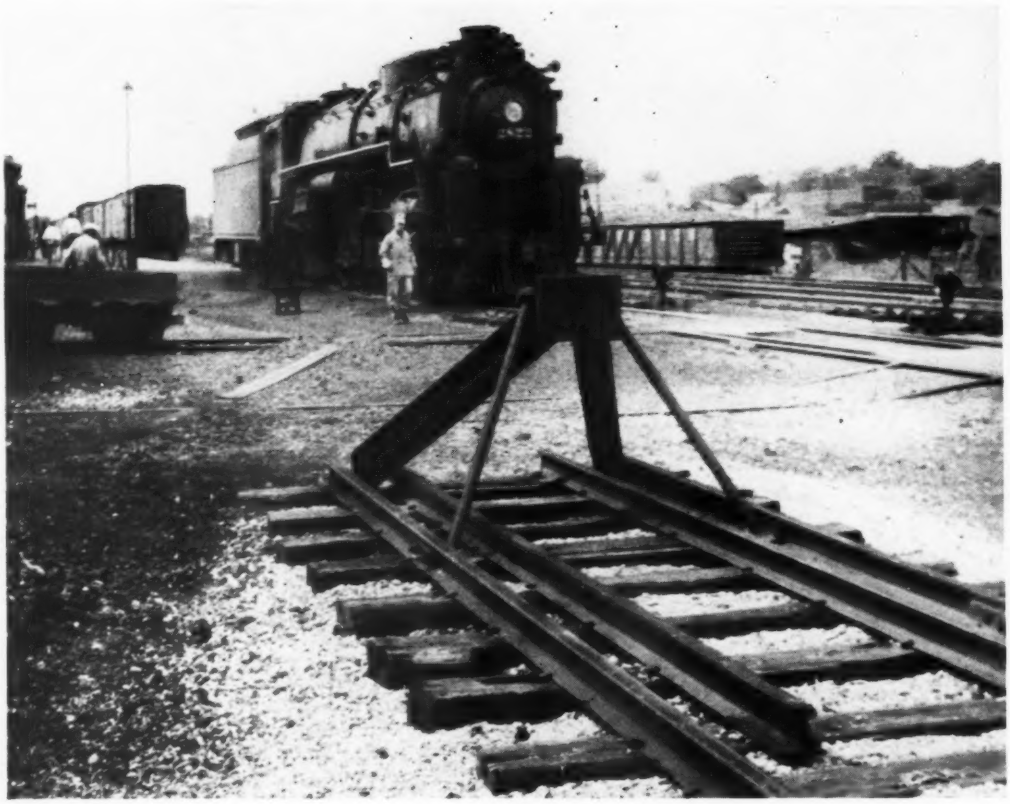


The bolted chassis is strongly built and well reinforced with angle irons and steel channels. Total weight of car 720 lbs. Rear lift only 105 lbs.

Unfavorable conditions that stall air-cooled engines do not affect the water condenser cooled Fairmont 5 to 8 H.P. O.D. engine. Water surrounds the cylinders and extends back of ports. The piston and rings never get too hot because boiling water maintains a uniformly ideal temperature for fuel economy and long life.

OF ALL THE CARS IN SERVICE TODAY

MORE THAN HALF ARE FAIRMONTS



To double the strength of the track with middle rails is a notable advance in bumping post practice

REDUCES MAINTENANCE EXPENSES *and*

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THE Lundie Tie Plate with its rounded steps of resistance holds track to gauge, and, most important of all, accomplishes this without injuring a single fibre of the tie. This scientifically designed plate provides tremendous holding power against plate movement and consequent spreading of track. The plate seats itself perfectly and gives proper inclination to rail so that wheels track properly . . . Lundie Plates are made with single or double shoulders to comply with A.R.E.A. specifications, or can be supplied to meet your own specifications. In preparing your budget, be sure to specify Lundie Tie Plates. Over 200 million in service prove that they reduce costs and improve track.

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LUNDIE TIE PLATE


BARCO MFG. CO.
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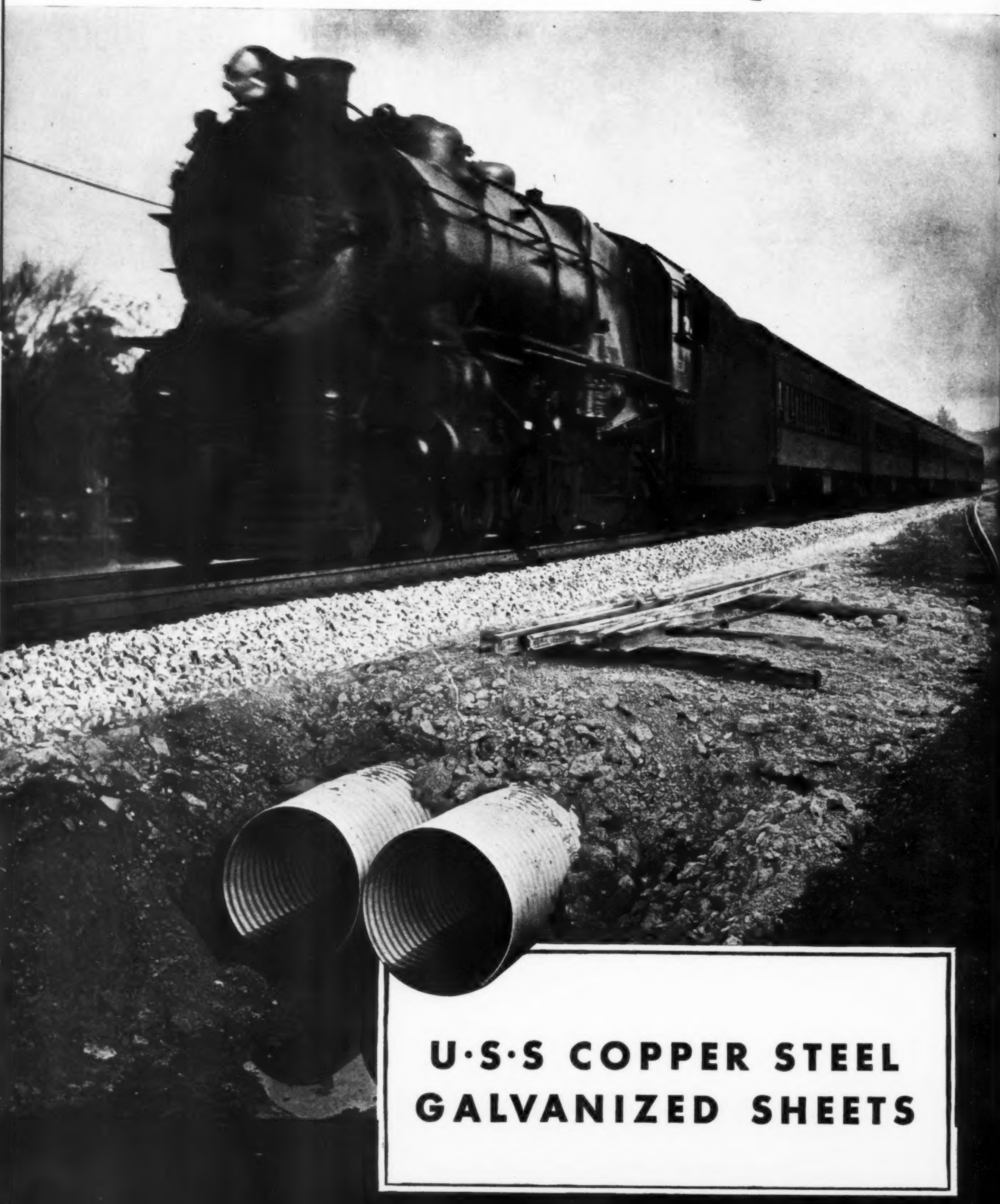
Why Copper Steel is the *Right*



Material for Good Culverts

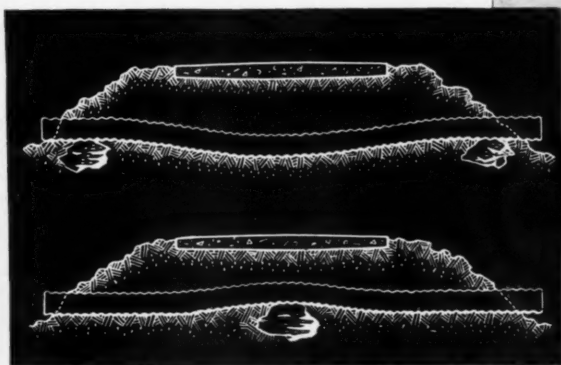
PERFORMANCE is the main objective in culvert installation—and the story of U·S·S Copper Steel is one of better performance at lower cost. The most convincing evidence of this is the fact that no culvert made of U·S·S Copper Steel has ever been known to fail structurally in service.

Copper Steel culverts are designed to resist such forces as sudden freezes, rapid thaws, sub-soil changes, heavy weight and vibration. They do not crack or fail under stresses that might destroy rigid materials.

Another strong advantage of U·S·S Copper Steel is its endurance. In 1911 U. S. Steel engineers discovered that a little copper added to steel more than doubles its resistance to rust and atmospheric corrosion under alternate wet and dry conditions. When galvanized, U·S·S Copper Steel has proved over a period of years to be a most enduring, low-cost culvert material.

COPPER STEEL RESISTS CORROSION. Countless installations and numerous tests conducted by independent testing laboratories show that U·S·S Copper Steel has the highest atmospheric corrosion resistance of any commercial culvert metals.

COPPER STEEL CULVERTS STAND UP under the constant pounding of traffic. The corrugations form strong repeated arches capable of carrying heavy loads.



NO CRACKING OR BREAKING from shifts in sub-soil. Corrugated culverts are built like accordions, with enough flexibility to adapt themselves to changing soil pressures without failure.

LOW INSTALLATION COST. Copper Steel culverts eliminate much expensive foundation and form work, can be handled with fewer men and do not require highly skilled labor.

TRAFFIC INTERRUPTIONS CAN BE PREVENTED. Copper Steel culverts are installed quickly and easily, often without stopping traffic. The result is substantial savings in time and labor costs.

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
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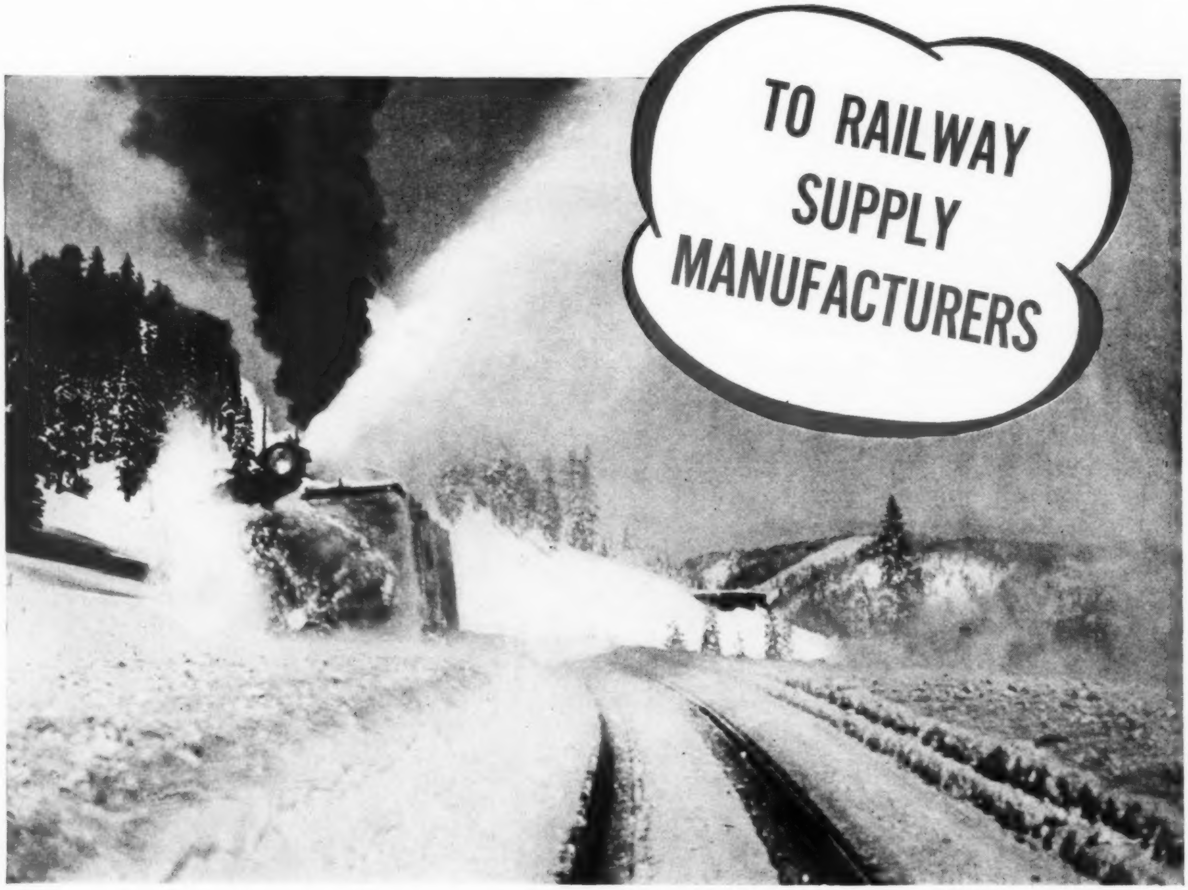
UNITED STATES STEEL



CLEARING THE WAY

FOR WORK EQUIPMENT SALES IN 1938

Railway maintenance officers are still working on their programs for 1938.

With so many pressing demands, they are facing the problem of selecting those that will yield the largest returns on the money they have to spend.

Will YOUR equipment be on their lists?

Do these railway officers—on the line and at headquarters—know its possibilities?

Are you telling them YOUR story?

The March Issue—the Annual Equipment Economies Issue—of Railway Engineering and Maintenance will focus attention on work equipment, and feature its economies in editorial and advertising pages alike.

It will be especially timely this year when all programs are being held open later than usual awaiting the rate decision.

Will YOUR equipment be featured therein?

Forms close February 19.

No. 110 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION
105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Second Class Postage

Dear Reader: February 1, 1938

As a subscriber to Railway Engineering and Maintenance, you are interested in every factor entering into the cost of producing this magazine. One factor in this cost is that of delivering the magazine to you. It is brought to you by the post office department under the second class privilege. For this reason, you have an interest in the operations of the second class postal service.

You probably saw references in the daily press a few days ago to the annual report of the postmaster general for the fiscal year ending June 30, 1937, in which it was stated that the post office department spent $89,000,000 more for handling second class mail than it received therefor. This figure was also broken down to show that the cost of handling magazines exceeded the revenue therefrom by $24,000,000. Commenting on these figures a few days later, the President referred to these deficits as "subsidies to the publishers." Was he correct? Let us look at a few facts.

Railway Engineering and Maintenance comes to you under two bases of postage. Its editorial pages are handled on a flat pound basis, while its advertising pages are subject to zone rates, increasing with the length of haul. For both bases we paid approximately $1,500 last year. This is at the rate of approximately 1.7 cents per copy handled. In other words, approximately 20 cents of the amount you paid us for your subscription last year went directly to the post office for cost of delivery of the magazine—for those of you at the more remote points this cost was appreciably higher.

Furthermore, second class postal rates have been the subject of debate for years and higher rates have actually been tried as recently as in 1932, with the result that so much of this mail was driven to other agencies for handling as to bring about a restoration of the lower rates in 1934.

But there is another consideration. As you know, second class postal rates were established in the early days of this country. They were established to make possible the widespread dissemination of newspapers and magazines among the people. For that reason, they are available only to publications that are "circulated in response to a genuine public demand." This means that the publication must be bought and paid for by the subscriber. The subsidy, if any, therefore, accrues to you as a subscriber.

I have brought this subject to your attention and have given you these figures in order that you may appreciate that second class postage rates are not the problem of the publisher alone, but are in reality just as much the problem of the subscriber, in making available to him the literature of the day at a cost which he can afford to pay. It was this thought which led the statesmen of earlier days to inaugurate second class service. Is not the original concept equally in the public interest today?

Yours sincerely,

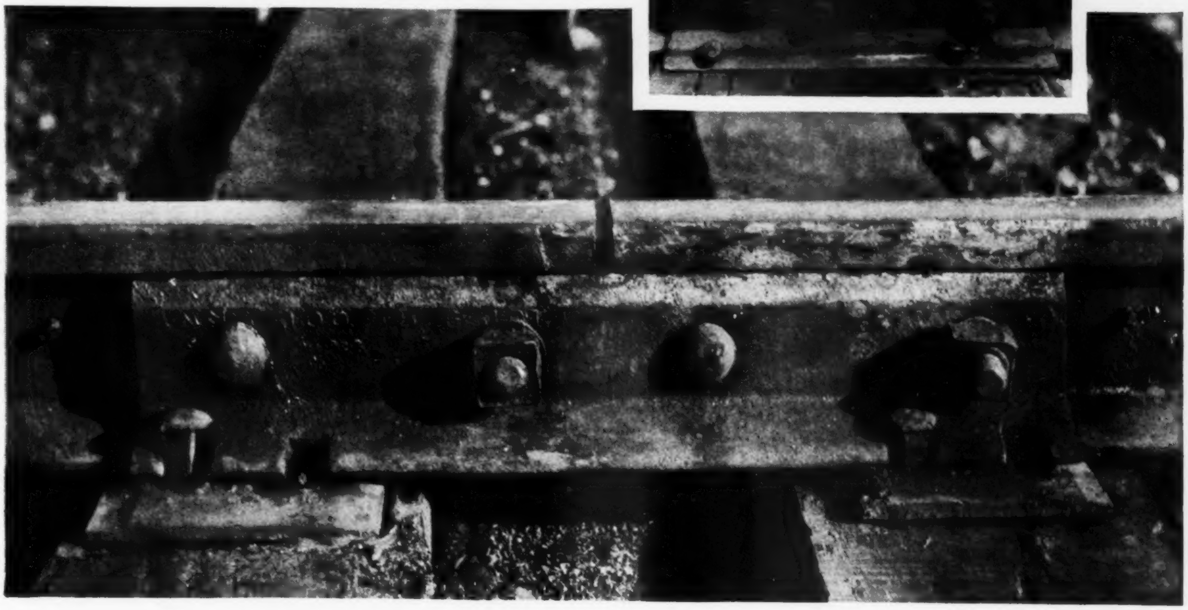
Elmer T. Howson

ETH:EW Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

Right. Worn rail ends, shown under the straight-edge, accelerate depreciation of trackage and rolling stock.

Below. Rail ends are smooth and harder than the original rail when built up under standard procedures developed by Oxweld Railroad Service.



For Smooth Track . . rebuild worn rail ends

WEAR on locomotives, cars and track is greatly reduced when battered rail ends are built up by oxy-acetylene welding.

Oxweld engineers and instructors have cooperated in organizing and directing rail-end reconditioning on thousands of miles of track. The Oxweld oxy-acetylene procedures thus proved in practical use have greatly contributed to the speed and quality of the rail-conditioning projects done on Oxweld contract railroads. These procedures employ special welding rod and techniques developed by Oxweld's research facilities.

It will pay every engineer and roadmaster to review current track programs, having in mind more efficient and thorough capitalization of the advice and assistance available through The Oxweld Railroad Service Company.

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Unit of Union Carbide and Carbon Corporation

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OVER A QUARTER CENTURY OF SERVICE TO THE MAJORITY OF CLASS I RAILROADS

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

FEBRUARY, 1938

Railway Engineering and Maintenance

Railway Buying

Its Influence on Economic Recovery

EVERY railway employee is concerned today with the turn that business has taken during recent months because of its effect on his economic well being. We may well be interested equally in ascertaining the part that the railway industry can play in reversing the present trend and leading in the upturn. To aid in bringing about this result, he needs a full concept of the contribution that the railways normally play in our industrial life. This was summarized concisely by Col. Leonard P. Ayres, noted economist and vice-president of the Cleveland Trust Company, in a recent statement from which the following is quoted.

Col. Ayres' Statement

"Railroading is our 20 per cent industry. At present prices the value of railroad securities is equal to 20 per cent of the total values of all our listed corporation stocks and bonds. The railroads purchase 20 per cent of our bituminous coal and 20 per cent of our fuel oil. They buy 20 per cent of our total output of lumber, and 20 per cent of our iron and steel. Railroad prosperity is an essential component of national prosperity.

"Transportation contributes more dollars to national income than agriculture does. For each seven dollars that agriculture adds to our total income, transportation contributes eight dollars.

"If you think that agricultural prosperity is important for our national well-being, you ought to think that the prosperity of transportation is equally important. Railroad transportation is by far the largest element in total transportation."

21 Year Trends

In the light of Col. Ayres' statement, one may well review a few trends in the railway industry of late. Take locomotive purchases in the years 1917 to 1937, inclusive. In the first 7 years of this period the number of locomotives ordered annually averaged 1,756; in the next 7 years, 965; and in the years 1921 to 1927, inclusive, 201. Likewise, the number of freight cars ordered in the first 7 years averaged 85,389 per year; in the second 7 years, 83,480; and in the last 7 years only 25,450. Again, the number of passenger cars ordered per year in each of these 7-year periods averaged 1,150, 1,875 and 239, respectively.

As a result of this drastic decline in equipment purchases during the last 7 years, the railways now have approximately 12,000 less locomotives, 550,000 less freight cars and 12,000 less passenger cars than in 1930. And the same shrinkage in plant is evidenced in roadway facilities, for some 10,000 miles *more* railway lines were abandoned than built during this period.

Turning to dollars, the average annual *increase* in investment in railway facilities during the years 1916 to 1931 was $574,000,000. In contrast, the average annual investment in railway facilities *decreased* $87,500,000 during the years 1931 to 1936. Over this period of 7 years, the *decline* in average annual investment exceeded $660,000,000 a year.

And this is only part of the reduction in railway expenditures. In maintenance of way and equipment, the roads spent an average of $1,965,000,000 annually during the years 1916 to 1931, inclusive, whereas during the 5 years ending with 1936, they spent an average of only $1,043,000,000 a year, a decrease of $922,000,000 annually. If to this reduction in maintenance expenditures there be added the decrease in investment or capital expenditures, the total decrease in railway spending is brought to $1,600,000,000 a year—a tremendous retraction from the channels of trade and industry. It is only when viewed from this standpoint that the magnitude of the contribution which the railways make to prosperity in times of adequate earnings—and conversely to depression when forced to retrench—can be appreciated.

The Rate Increase

The universal realization of the contribution which the railways can make to national recovery is especially important now when the railways are before the Interstate Commerce Commission with their application for an increase in rates. Not only is this increase essential to the solvency of the railway industry and to the arresting of further receiverships, but the records of the railways in the past demonstrate that such increases in revenues as will be accorded them by the commission will be returned promptly to channels of trade and industry in the form of purchases of much needed equipment and materials. In other words, the granting of increased revenues to the railways serves not merely to relieve a condition of acute distress in one of the Nation's basic industries, but constitutes a contribution to

many other industries from which the railways purchase materials and supplies. It will also be found to comprise a contribution to the reduction of expenditures for public unemployment relief through the increased employment that will come from added purchases.

In the Public Interest

As such, the granting of increased rates to the railways becomes an action in the public interest. This is a consideration which railway employees can afford to stress in order that the public at large may accept increased rates for the railways as a public spirited measure that will aid in the stimulation of lagging industry.

This is the contribution that the railways can make and will make if given the opportunity. It is the contribution that Col. Ayres recognized in his characterization of the railways as "our 20 per cent industry."

Station Buildings

Why They Need To Be Modernized

THE article on page 100 of this issue offers another illustration of what can be done to modernize old railway buildings at an outlay that falls far short of the cost of replacement. However, the method used in this case, which involved the covering of the exterior with a serviceable and attractive wall sheathing represents only one of many expedients that may be applied.

These shortcomings may be placed in two general categories, those resulting respectively from depreciation and obsolescence. As a rule, conditions arising from the first cause call for repairs unless the state of deterioration has reached a stage that demands expensive rebuilding. Obsolescence is manifested in so many forms that no general cure can be set forth. Not infrequently a building suffers from depreciation as well as obsolescence, so that corrective measures must be designed to overcome both.

The most common form of obsolescence is an outmoded style of architecture that discloses the antiquity of the building. This is especially objectionable in the case of structures built during the eighties and nineties of the last century, which embraced the worst period in American architecure. They produce a distinctly unfavorable reaction on the public, conveying the impression that the railroads are distinctly out of date.

Obsolescence of a much more practical nature is encountered in the arrangement of buildings. For example, the need for separate "Ladies'" and "Gentlemen's" waiting rooms is as obsolete as the terms once used to designate them. In some stations, also, the waiting rooms are much larger than is necessary. With modern means of transportation to stations, patrons of the railroads allow themselves so little time that even the term "waiting" room is becoming obsolete.

Another form of obsolescence is to be found in the accessories of buildings, such as lighting fixtures and plumbing, that no longer serve their purpose adequately because newer materials and appliances perform the same functions much more effectively and efficiently.

These examples are by no means all-inclusive; they serve merely to illustrate the kind of things that call for modernization. The measures to be adopted to meet a situation can be determined only by a study of each individual case. This subject offers an unusually fertile field for the exercise of resourcefulness, ingenuity and good taste.

Inspection Cars

Are Railway Officers Safety-Minded?

FOR three decades Safety First has been a constant slogan of the railways, and intensive effort has been exerted to instill the principles and practices of safety into the minds and activities of the rank and file of railway employees. That this has been a laudable undertaking no one will deny, and it is not debatable that an untold amount of suffering has been avoided by this almost continuous safety campaign.

So far as is known no voice has ever been raised in opposition to the railway safety movement. Executive, operating and supervisory officers alike have supported it with enthusiasm and often with the spirit and zeal of crusaders. But have these officers always practiced what they have preached? Have they been meticulous to set the proper example before the men they have labored so hard to educate to the constant observance of safety rules? We know many of them who have been most meticulous in this respect.

But is this universal? How about the roadmaster who ran his track motor car into the caboose of a standing freight train in broad daylight, killing himself and injuring his two companions? How about the superintendent operating an inspection car at night, who, failing to slow down for a highway crossing, luckily escaped with his life but was sent to the hospital for several months as the result of the derailment of the car, caused by an obstruction in the flangeway of the crossing? How about many other cases of reckless driving of inspection cars that have resulted in death or injury to all or some of the members of the inspection party?

Inspection degenerates into joy riding when the speed passes the point where it is impracticable to observe details. Furthermore, it is a matter of common knowledge that the operation of track motor cars at high speed creates a hazard. Yet automobiles fitted with flanged wheels for track use seem to inspire their drivers with an uncontrolled desire to see how fast they will go, so that they become a triple menace, to men working on the track, to vehicles at grade crossings and to the occupants of the car.

Yet speed is not the only hazard connected with automobiles converted to track use, although it may intensify the dangers that arise from other causes. Some of the inspection cars now in service have been converted from automobiles and are not adapted for track service. In not a few cases, vital parts, especially axles, that have performed satisfactorily in highway service have been found to be incorrectly proportioned for railservice and have failed in use, exposing the occupants to serious danger. Dependable inspection cars that have

been designed especially for the service are available from reputable manufacturers. There can, therefore, be no reasonable excuse for continuing the use of obsolete and unsafe cars as is being done on some roads.

Railway officers of all ranks have a responsibility which they cannot evade, for setting an example in safety practices. Reckless operation of motor cars and the continued use of obsolete equipment without regard to the hazard involved, constitute a definite shirking of this responsibility.

A New Index

Did You Notice It?

WITH the close of the year 1937, *Railway Engineering and Maintenance* inaugurated an added feature which, it is hoped, will be of interest and benefit to many of its readers, and, incidentally, an added service also to those railway supply manufacturers who use its advertising pages. This is an index to the advertisements, which forms the last page of the annual index issued as Part II of the January issue. The reader now has an index which will become increasingly valuable as the companies represented in the advertising pages make these pages increasingly attractive, varied and informative, and as the busy practical men who read *Maintenance* learn to use this index as instinctively as they now use the annual editorial index.

Turntables

Locomotive Buying Brings Them Again to the Fore

THE history of the American railroad turntable is essentially a record of replacements for the purpose of accommodating locomotives of ever-increasing lengths and the attendant transfer of the released tables to secondary or tertiary lines, concurrent with the reassignment of locomotives that always follows the acquisition of new power. Little activity in this field occurred during the recent period of curtailed capital expenditures, but now that new locomotives are again being received from the manufacturers the problem of the turntable is once more being brought to the fore.

For some years the trend toward longer tables was retarded by the demonstration that, contrary to opinions previously held, it is entirely practicable to turn a table with an appreciable proportion of the total load applied to wheels bearing on the circle rail. As this obviates the necessity for balancing the locomotive on the table, it is possible to turn engines on a three-point-bearing table that is not infrequently several feet shorter than would be necessary if it were required to balance them over the pivot bearing. The idea has been applied extensively; nearly all new tables now purchased are of the three-point type, and many roads have avoided the purchase of longer tables by equipping old pivot bearing tables with new end trucks and adequate power drives so that they can be turned under unbalanced loads. A change to the three-point bearing also facilitates the lengthening of old tables, because the application of an appreciable proportion of the load to the circle rail makes it possible to avoid an increase in the concentration of weight on the center bearing.

Of no less importance than the providing of turntables of adequate length is the requirement that their component parts be of adequate strength for the service and that they be maintained in good condition. Design and maintenance have a peculiarly close inter-relation so far as turntables are concerned, and no one is in a better position to know how details of design affect maintenance than the men who look after them. It is because of the crushing of wood ties at the ends of tables, for example, that some roads are now substituting heavy-section wide-flanged beams in these locations.

The failure of a turntable might almost be classified as a disaster. Almost any measure for the perfection of details and the proper care of turntables that will afford increased security against failure is warranted.

Accident Reports

Their Interest Value in Promoting Safety

MORE than a quarter century has passed since the American railroads adopted the "Safety First" slogan, and the results of their unceasing efforts to curtail accidents are so well known that it is unnecessary to enlarge upon them here. The campaign for greater safety was a success from the start. Employees responded with enthusiasm, for while they knew that a reduction in accidents would effect a monetary saving to their company they realized also that they, themselves, would enjoy the major share of the benefits. Still another reason for sustained interest was the fact that it was a novel idea—something new to talk and think about.

However, as the years passed those responsible for accident prevention—and this includes not only the safety agent but all men who direct the work of others—have been confronted with the problem of sustaining interest in a subject that is no longer new. Leaders in this movement have developed various means of presentation, such as safety meetings, safety rules, safety films, safety examinations, safety posters, etc., but the problem is still before us. Every foreman is still faced with the question, "How can I keep it from being an old story?"

It is for this reason that we present on page 92 of this issue a paper by C. H. Longman that provides an answer to this question, because this paper illustrates the "case method" of discussing safety. The secret of the case method lies in the fact that every one likes to hear a story, and the story of an accident is always charged with intense human interest, especially when it concerns men doing the same work as the hearers.

The lesson is obvious. The teller of the story is sure of an attentive audience, and having gained attention, he can drive home the lesson by pointing out the cause of the accident and showing how it could have been prevented. Every reader of Mr. Longman's paper will find in it stories that he can use to good effect.

Progress? L

By ROBERT FARIES

Assistant Chief Engineer, Maintenance, Pennsylvania System

The extent to which the railways are refining the designs of the component parts entering into their tracks and structures and increasing the load carrying capacity thereof is revealed in a striking manner in a review of recent developments on the Pennsylvania, presented by Mr. Faries before the Pittsburgh Railway Club.

RAILROADING has been changing rapidly in the last few years, and with these changes the demands upon the track have increased. Higher speeds; or, more properly speaking, sustained high speeds have been attained. Increased size of power with increased tractive effort have provided greater acceleration and greater speed on ascending grades. The close schedules of freight trains require quickened operation in yards and make freedom from yard derailments imperative. Restrictions put on tracks in order to carry out repairs are increasingly detrimental and must be minimized.

Are Making Tests

In order to gain knowledge of the effect of weight and speed upon track, we have conducted prolonged and extensive tests in developing a heavy, powerful, high-speed electric locomotive. In these tests we used novel instruments to determine stress, acceleration and lateral forces—stress with magnetic strain gages, acceleration with special types of accelerometers, and lateral forces with magnetic strain gages, and Brinell type steel tie track. Stress measurements have been taken on rails, joint bars, bridges and on equipment. The speeds used in tests have been generally up to 100 to 105 miles per hour. We are arranging now to conduct one of the tests at a speed of 120 miles per hour.

A number of interesting facts have been developed. For instance, considering lateral forces exerted upon the rail:

A 4-6-6-4 electric articulated locomotive delivered 23,300 lb. at 100 miles per hour, and the intensity of the blow was increasing at the rate of 130 lb. per mile per hour.

A 4-6-2 steam locomotive delivered 25,000 lb. at 100 miles per hour, and the intensity of the blow was increasing at the rate of 250 lb. per mile per hour.

A 4-8-2 steam locomotive delivered 52,000 lb. at 80 miles per hour, and the intensity of the blow was increasing at the rate of 1,250 lb. per mile per hour. This latter engine, when provided with additional lateral resistance in the trailer truck, delivered 26,500 lb. at 80 miles per hour.

Effect of Speed Restrictions

The effect of poor track on the lateral forces is indicated by a test in which the cross level was made about ½ in. low on one side, then reversed and made ½ in. low on the other. At the same speed and with the same equipment, lateral forces were increased from 7,000 lb. on the good

? Lots of It

In Track Design

track to 35,000 lb. on the irregular track.

The effect of a 30 mile per hour speed restriction ½ mile long has been studied and it has been found that it takes from two to three times the distance from start of retardation to restoration of full speed when running 90 miles per hour as compared with 75 miles per hour. In a 100-mile run, the elimination of from five to six such speed restrictions will accomplish the same result as an increase of speed from 75 to 90 miles per hour. As the speed increases, the effect of speed restrictions increases rapidly. This is particularly true with respect to freight trains since the restoration of the higher freight train speed, after observing a restriction, may take many miles of otherwise unrestricted territory. The elimination of several speed restrictions on a division will, in many cases, result in the elimination of double heading both passenger and freight trains in order to make tight schedules with heavy trains. The elimination of speed restrictions in dense traffic territory adds to the capacity of the railroad.

In order that proper materials may be provided for our maintenance, we have a total of approximately 200 field tests under way continuously. From these tests we are enabled to know with reasonable certainty just how these materials are going to perform before purchases are made in any quantity. The facts developed in these tests are made available to manufacturers upon request and should also be beneficial to them.

As a result of the knowledge gained from these tests, we have been able to improve our conditions, and it is to some of these impromements that I would like to direct your attention.

Roadbed Improvement

In starting to stabilize track, the natural approach is, first, consideration of the roadbed. There is a vast difference in the materials which make up roadbeds of railroad track and differences in the methods of construction which affect the stability of the track. Fills made of clay, or fills on soft material, are rarely satisfactory. Cuts through clay always give trouble unless careful study is made of the contours of the clay surface under the roadbed and the low points drained in a permanent manner. In an area of particularly poor subgrade on our line between Philadelphia and Washington it was necessary to make such surveys as I have indicated, and to preserve the drainage of the low spots by placing mats of treated wood on a layer of cinders. The clay surfaces in these trenches were covered with a bituminous mixture to prevent capillary water from reaching the surface. At other points the general water level has been lowered from 4 ft. to 8 ft. by open ditches, by drains of treated wood and by the use of iron pipes laid in trenches and back filled with a porous material such as pit run gravel.

Samples of all the ballast used on our line are subjected to a laboratory test. Certain standards are set up and the different products graded so that the best ballast available will be provided. Our standards now provide for an additional foot of ballast on the shoulders to add to the stability of the track. A great deal of ballast cleaning and track surfacing can be avoided by the use of good hard ballast that will not break up under tamping.

Making Ties Last Longer

Our people assure me that they can treat ties to last as long as the mechanical wear and splitting will let them last. Mechanical wear has been reduced by larger plates and better fastening of the plate to the tie and the splitting of ties, which results in quite a large item of expense, has been controlled by a better method of using

Rapid Changes in Railroading Have Increased the Demands on the Track

anti-splitting irons. Ties usually fail from vertical splits which start at both the top and bottom of the tie. We now place two irons in each end, locating one near the top and another near the bottom, instead of using one iron near the center. The center iron did not come into use until quite a large split had formed, and then it was inadequate to resist the strain caused by the wedging action of dirt and stones in the crack and the freezing action of the wet material in the cracks. Treated ties make a stronger track because nearly all of the ties in a rail panel are sound all of the time, while with untreated ties a number in the panel are always near to renewal time.

Track Construction

During the past few years, the quality of rail steel has been greatly improved, both by methods employed prior to rolling and by slow cooling and normalizing of the rail after it leaves the rolls. These improvements give every indication of eliminating completely the shatter cracks which result in the transverse fissure. The stresses in 152-lb. rail under our heaviest locomotives are just about half what they were in the rail used 25 years ago. About this same relation exists with respect to the amount of depression under load; and it is thus apparent that the wave motion in the track, which is one of the principal causes of track deterioration, has been eliminated to a great extent. Both the 131-lb. RE rail section and the 152-lb. PS rail section, which have the same contour of the top of the head, show, after six years in a test track under heavy traffic, only 50 to 70 per cent of the abrasion of the former 130-lb. section in the same test. This applies to tangent and curve. I attribute this resistance to abrasion to the fact that the rail head contours of the new sections are flatter and the initial cold rolling extends entirely across the head, consolidating and improving the metal in this area quickly so that it is more resistant to subsequent wear.

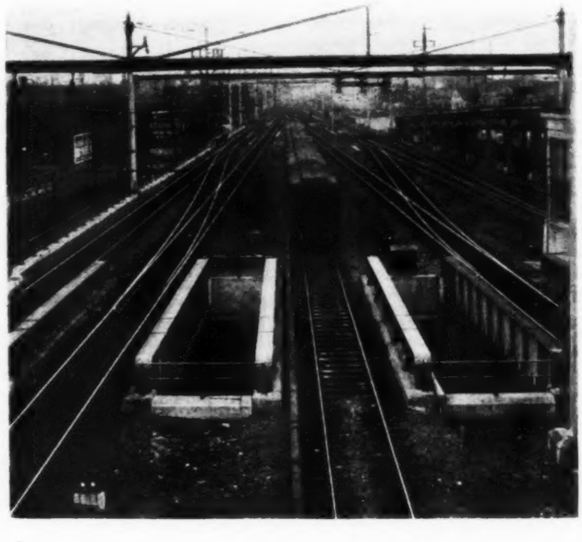
We have had end-hardened rail in a test track which has now carried approximately 300,000,000 tons of traffic and the ends of the rail are slightly higher, about 0.015 in., than the general surface of the rest of the rail. With very little grinding, the rail can be restored to its top condition when new.

We have found a number of advantages in a long joint flexible enough to insure a tight fit at the rail ends and at the bar ends, and have gone to this type exclusively. We carry out a substantial program of welding and grinding at the joints, covering approximately 500 miles of track annually.

Frogs and switches have been redesigned to give additional strength and longer service life. This has been accomplished by the elimination of short bends and fillets, and by reinforcing parts where weakness has developed in the past. Bolt shrouds have been eliminated in the manganese body castings, and cross ribs have been substituted to reinforce the manganese casting by which we thereby obtain a more uniform thickness and reduce the shrinkage cracks and strains set up by cooling.

Wing wheel risers have been provided to relieve the thin portion of the frog point of wheel loads, thereby reducing batter and spalling at the point of the frog. On spring frogs the individual tie plates have been replaced with continuous base plates, held rigidly to the base of the frog with clips and bolts. The toe of the spring rail has been shortened so that there is less movable rail about the frog. Heavy toe blocks have been provided and the planing of the base of the rail has been changed to eliminate the short fillet which formerly caused numerous breaks. Hydraulic snubbers have been applied to spring rail frogs where there is frequent movement through the turnout runs. This prevents excessive pounding by the spring rail, which tends to loosen all parts of the frog. Heel blocks have been provided to insure the position and fit of the switch with respect to the stock rail, and to give increased strength about the heel of the switch. Most switches are protected by providing a machined housing in the stock rail approximately ⅛ in. deep.

We are now installing a number of 45-ft. switches. Switches of this length eliminate the abrupt angle at the switch point, which always resulted in considerable thrust at this point and added to the cost of maintaining the turnouts.



Better Designs of Frogs as well as Switches Result in Longer Service

Know More About Impact

By the use of magnetic strain gages, knowledge of the actual stress in certain types of bridges has been obtained, which types of bridges are incapable of acurate calculation. From a better knowledge of impact stresses, we have been able to permit higher speeds than were thought justified by former inadequate knowledge of this subject. This has saved us a great amount of money for the renewal of bridges which were formerly thought questionable.

The speeding up of the movement of cars through yards is a very important factor in meeting fast freight schedules. There are many things that can be done to prevent yard derailments, among which I mention the elimination of short turnouts, the protection of switch points by guard rails or other devices, the grinding of switch points and stock rails to preserve the proper fit, providing heel blocks for switches, and preserving the proper flangeways through frogs by grinding.

Mechanization of Maintenance Work

For a number of years there has been a constant trend toward doing maintenance of way work mechanically wherever it was found possible to do it. This was prompted not only by reasons of economy, but for safety reasons and to provide better and

(Continued on page 101)

Preframing Timber Before Treatment

For Use in Bridges and Buildings*

An Example of the Trestles that Have Been Preframed Before Treatment

By C. J. GEYER

Engineer Maintenance of Way, Chesapeake & Ohio

TWENTY or 25 years ago the treatment of timber to extend its life had reached a thoroughly practical basis. The railroads were beginning generally to treat their cross ties, and as this practice became more extensive, more attention was directed to extending the life of timber going into bridges and trestles and other roadway structures. This at once focused attention on the problem brought about by cutting into timbers after they had been treated because this partly destroyed the protection provided by the treatment. Not only did the disturbing of the treated surfaces by sawing and cutting give concern, but it was early learned that the fastening of such treated materials together called for careful consideration of the factors invlved.

Treated Timber Introduced New Problems

To solve this problem, the first steps taken were to attempt to provide a field treatment for exposed surfaces caused by cutting or boring, that approached the plant treatment that the particular timber had received. To secure suitable protection under such conditions, however, was readily recognized as difficult, and many expedients were tried, the earliest of which embodied the mere brushing on of a creosote solution. Later measures employed special capping or sealing compounds and devices, some of which must still be employed where it is necessary to cut or bore treated materials.

When it was seen that these field methods of protection left much to be desired, attention was diverted to the practicability of framing the timbers to their final shapes or sections before they were treated. Some of the earliest work of this nature was carried out in connection with the hand dapping (followed a little later by machine dapping) of some bridge ties and guard rail timbers.

The early preframing before treatment, by hand, was costly and lacking in precision, because of the varying conditions under which it had to be done. Generally, it was done at the site of the work, in good weather or bad, and under other unfavorable conditions. This is the day of the machine, and just as the motor car has taken the place of the lever car, machinery was designed for use in framing timbers in a precise and economical manner.

With the coming of machinery for this job, the next step was to set up practical means for getting the preframing done, and it was definitely seen that the greatest economy and effectiveness lay in centralization of such work. Roads had to study their individual problems, particularly with regard to the sources of supply for their timber, to determine just how centralized preframing could best be done. Generally, this was found to be met best by doing the work at regional or system plants that were treating the timber, although I believe that in many cases the preframing work has been done away from the treating plants and the materials then shipped to the plant for treatment.

One railroad found that its timber supply came from no one small or restricted area, but reached its line at practically all points, and conversely, that the materials went to all parts of the line for use. It was found also that a treating plant was located at one of its larger terminals, almost at the geographic center of the line, and within 100 or 150 miles of most of its secondary or feeder lines. This terminal, at which the treating plant was already located, was obviously the proper location for the timber framing plant.

A Framing Program Necessary

To secure the greatest benefit from pre-framing and treating on any road, a definite policy must be devised and the work carefully programmed in all instances. Typical of how this is

*Presented before the Users' Day session of the 34th annual convention of the American Wood-Preservers' Association at Chicago on January 19.

done is the practice followed out on one road. Here, a field inspection is made each fall by the system officer in charge of bridge and building work and his staff, accompanied by the local officers concerned in such work. Each bridge, building, and structure is inspected and determination made on the ground as to what work should be done during the ensuing year.

When such inspections are completed, a program can be set up, and it can be determined what expenditures will be necessary to carry out the program. From such a schedule and from the knowledge of conditions obtained in the field, any necessary adjustment in the program can readily be made.

When the program for the year has been decided upon, the purchasing department is in a position to secure timber to replace that to be taken from stock during the year, the stock being maintained to insure proper seasoning before treatment in all cases. In this manner, surpluses are avoided in timber stocks. With the program decided upon in this manner, the individual items of work can be spread over the year to permit the employment of more or less uniform forces and to keep the pre-framing and treating on a current basis.

Marking the Timbers

Where the work involves timbers in a standard plan, the details of getting the proper framing done at the centralized framing plant is simple. The requisition for the timbers merely shows a reference to the standard plan, the number of bents, the height of each, and the distance center to center of bents in the case of trestles. Where designs that depart from the standard are encountered,, or other special conditions exist, a little more information is necessary. Field measurements are then taken carefully and simple sketches prepared to accompany the requisitions to the framing plant. Printed forms and diagrams greatly facilitate the preparation of such data.

The road referred to has in effect a plan whereby stringer chords and frame bents are assembled at the framing plant for fit and are bored prior to treatment. All preframed timbers are marked before treatment, and in the case of trestles more than one story high, and in other structures of a similar nature, erection diagrams are furnished the forces which will handle the installation.

The road in question has found the following simple system of marking the timbers fully efficient and easily understood in the field. Posts are marked with the letter "P" on the end of the stick, followed by a number to designate whether it is the first post, second post, etc., from the south side, basic directions on this road being east and west. Thus, the second post from the south side receives the marking P2. The letters A and B indicate the east and west faces of the post, respectively, and the end of the stick bearing the marking is always the top. Further marking with B, followed by a number opposite the designation for post position, indicates the bent position. Caps and sills are marked similarly, except the P is omitted, caps being distinguished

Example of the Method of Marking Preframed Posts for Trestles

from sills by the fact that they are 12 in. by 14 in. in dimension, and sills 12 in. by 12 in. Sway and sash braces have similar simple markings to insure proper installation.

Pre-boring Also Helpful

On practically all roads that are carrying out preframing work today, the framing of trestle timbers is accompanied by the pre-boring of all holes except those for the fastening of sway, sash and tower bracing in pile trestles, and the boring of trestle ties includes holes for spiking the running rails and for fastening guard timbers, as well as for deck anchor bolts in certain alternate or staggered ties. With such a procedure, the work is handled with such accuracy that it is seldom necessary to do field boring of holes except in connection with pile trestles as commented on above.

One railroad has found it very advantageous to have its work on pile structures carried out in two stages in order to secure full advantage of pre-framing before treatment and to minimize or entirely eliminate field boring or cutting. In doing this, pile driving is first done, the new piles being driven where practicable beside the old, or where necessary by reason of the location of the old piles, and data are then prepared from actual measurements for the pre-framing of other timbers going into the work. This, it will be seen, carries the pre-framing work to a fine degree, but the results indicate that it will be fully justified by the additional service life.

Any road that is not now preframing its timbers before treatment would probably not adopt all at once the elaborate schemes for pre-fabrication of timbers carried out on some of the railroads, but will develop the work step by step just as the roads that are now securing the greatest advantages have established and extended their work in this respect.

One Road's Operations

The following figures have been secured from a representative road which began preframing operations about 1925 and has gradually improved and extended them until today that road's policy is to pre-frame virtually all timber treated, regardless of the type of structure in which it is to be used; namely, the decks of steel bridges, pile and frame trestles, buildings, docks, small box culverts, and miscellaneous structures.

This road's preframing layout includes the following equipment, secured and installed in the order shown:

Bridge tie dapper
Cut-off saw
Bridge tie borer
Rip saw
Band saw
Planer

As an illustration of the economies effected in this establishment and gradual improvement of centralized, mechanical preframing work, it was found that with the installation of the bridge tie dapper the cost of dapping was decreased from 65 cents per tie to 35 cents. The road to which I refer recently estimated the value of its layout for preframing timbers as $24,000.

Taking account of depreciation, cost of power, cost of miscellaneous tools, etc., and actual labor, the preframing expense for the year was $24,600. For this expenditure, it preframed the following units or items:

22,343 pieces of bridge ties	1,680,459 FBM
12,842 pieces of trestle ties	663,444 FBM
10,214 pieces of structual timber	1,731,351 FBM
82,103 pieces of miscellaneous timber	280,764 FBM
127,501 pieces	4,356,018 FBM

Thus this road preframed, in round figures, more than four and a quarter million FBM at an expenditure of slightly less than $25,000.

The average cost per FBM for the different classes of timber is interest-. ing also:

Item	Pre-framing Cost Per FBM
Bridge ties	$ 4.33
Trestle ties	2.89
Structural timbers	6.49
Miscellaneous timbers	10.42
Average for all	$ 5.36

Comparative Figures

Based on this road's experience in framing costs on such work when done in the field, the same framing work would have cost $76,230 there as compared with the $24,600, or a saving for the year of $51,630, not taking into account the intangible savings resulting from the greater precision in framing and treatment at the critical framed or bored points comparable with or better than that obtained in the general treating of the timber.

Interesting and not to be overlooked is the fact that this road salvaged at the framing plant during the year materials for 66,922 wood blocks for use as flooring, and the of timber can be pre-framed and bored successfully before treatment. cost of preparing these blocks for treatment and use was included in the figures shown for miscellaneous timbers. The labor cost for preparing these blocks was found to average $0.014 per block.

Conclusions

In conclusion, present-day pre-framing knowledge and practices can be summarized as follows:

1. Pre-framing and pre-boring of timbers for bridge and structure work before treatment is justified from an economic standpoint, in order to secure for the framed or bored sections or areas treatment comparable with or superior to the general treatment the timber receives, it being obvious from experience that points at which any timber is framed or bored represent the points most vulnerable to attack and consequent shorter life.

2. It has been found by actual experience on railroads having a well established policy for pre-framing and boring that almost all types or kinds of timber can be pre-framed and bored successfully before treatment.

Two Roads Announce Track Awards for 1937

Of the many roads which, in more prosperous times, used to make annual track inspections with some form of reward for the winners, only three or four roads continued this practice in 1937. Two of the roads which have made reports of their 1937 inspections are the Norfolk & Western and the Pennsylvania.

Norfolk & Western

Eighty-one foremen were awarded cash prizes totaling $2,100 as a result of the annual track inspection on the Norfolk & Western. According to ratings established, the condition of the tracks on the road continued to show improvement over recent years, and, in fact, were judged to be in better condition than at any time since annual inspections were inaugurated on the road more than 40 years ago. Further evidence in this regard is seen in the fact that of the 27 roadmasters' districts on the system, 18 were given higher ratings in 1937 than in 1936.

As has been the custom for many years, the inspection for 1937 was made by separate committees on line and surface, switches and frogs, ditches and roadbed, right-of-way, station grounds, and road crossings, and first, second, third and fourth prizes of $40, $30, $20 and 10, respectively, were awarded generally to foremen on each roadmaster's district. On the basis of 10 as perfect, a system rating of 9.29 was established in 1937, which is two hundredths higher than in 1936 and 1935, three hundredths higher than in 1934, and five hundredths higher than in 1933. On the same basis of 10, the highest division honars went to the Roanoke terminal, with a rating of 9.38, while the second highest division honors were won by the Scioto division, with a rating of 9.36. Among the roadmasters' districts, the Roanoke-Walton district of the Roanoke terminal, and the Greggs Hill-Columbus district of the Scioto division, tied for first honors with a rating of 9.40, while the next highest rating of 9.39 was awarded to the Clinch Valley line of the Pocahontas division, and also to the Vera-Cincinnati district of the Scioto division.

Section foreman T. H. Hardin, on the Pocahontas division, at Cedar Bluff, Va., and W. V. Crosby, on the Scioto division, at Lockbourne, Ohio, tied for first section honors on the road with a rating of 9.47, while the second highest section rating on the system, 9.46 was given to F. P. Combs, on the Radford division, at Rural Retreat, Va., to J. H. Baldwin, on the Pocahontas division at Wilmore, W. Va., and to G. C. Ridout, on the Scioto division, with headquarters at Winchester, Ohio.

Pennsylvania

As in past years, the Pennsylvania rated the various divisions, subdivisions and sections on the road as the result of periodic inspections made throughout the year by special track inspection committees headed by the chief engineer maintenance of way of each region. At the end of the year, letters of commendation, from their superior officers, were sent to those supervisors and foremen whose territories received the highest ratings on the respective regions of the road. Following are the names of the supervisors and their assistants (where they have assistants), whose territories received special commendation.

New York Zone—New York division—A. J. Greenough, New Brunswick, N. J.; L. H. Miller (assistant). Long Island railroad—Lee Spencer, Jamaica, L. I.; W. W. Hay (assistant).

Eastern Region—Maryland and Baltimore divisions, main line—E. E. Kinzel, Washington, D. C.; H. M. Leppich (assistant). Baltimore division, branch line—E. G. Adams, York, Pa.; W. H. Taylor, Jr. (assistant). Middle division, main line—R. H. Meintel, Huntingdon, Pa.; J. F. Piper (assistant). Middle division, branch line—R. H. Joyce, Tyrone, Pa.; James Radcliffe (assistant). Philadelphia division, main line—M. C. Bitner, Lancaster, Pa.; J. C. Warren (assistant), Philadelphia division, branch line—L. R. Bailey, Columbia, Pa.; J. W. Buford (assistant). Philadelphia Terminal division—G. M. Hain, Philadelphia, Pa.; A. R. Matteson (assistant). Delmarva division—K. J. Silvey, Harrington, Del.; E. S. Barrett (assistant). Williamsport division—H. L. Byrne, Williamsport, Pa.; J. L. Tedesco (assistant). Wilkes-Barre division—E. R. Shultz, Reading, Pa.

Central Region—Best of all main-line supervisors' subdivisions—D. A. Sipe, Pittsburgh division, main line,

(Continued on page 101)

Unsafe Practices—

A Few

By C. H. LONGMAN
Assistant General Manager,
Chicago & North Western

This View Shows the Safe Use of a Track Wrench. The Man in the Other View Is in Serious Danger of Being Hurt in Case the Wrench Should Slip

No better understanding of the safety problem can be obtained than by a consideration of the factors involved in specific accidents. In this article, Mr. Longman, following one of his own rules for promoting safety, resorts to the "example" method in explaining why certain types of accidents in maintenance work occur and how they can be avoided.

ACCIDENTS sometimes occur because foremen forget that they are supervisors and attempt to assist in the work. When so engaged it is not possible for a foreman to supervise his men properly or to exercise the proper vigilance in protecting himself and his crew from injury. An example of what can happen when a foreman assumes the role of a laborer occurred on the North Western. A section foreman and three men were cleaning out switches in the winter. At the time of the accident the laborers were in the clear as an engine approached, but the foreman remained between the rails cleaning out the switch points and was struck and run over. A test made shortly after this accident occurred proved conclusively that the engineer could not have been maintaining the proper lookout, as it showed that, if he had been looking, he could have seen this man plainly at a distance of 145 ft.

If accidents of this kind are to be avoided, the first step is to educate the foreman to be a supervisor. He must understand that he is not to perform the labor but must supervise his men and be on the alert for approaching engines or cars, or have a flagman stationed for that purpose. Train and engine crews must also be cautioned to keep a lookout in the direction of movement, and to ring the bell and sound the whistle when necessary.

We all know that it is a problem to protect extra gangs in multiple track districts. Last summer while I was observing an extra gang of about 125 men working on the center track of a three-track district, a passenger train approached from the west and another from the east. The general foreman sounded his whistle and moved his arm to indicate that all men should stand in the center of the track. About 25 of the men misunderstood his signal and moved over onto the westbound train, directly in front of the passenger train and it was only a miracle that saved these men from being run down.

To avoid such dangerous situations it is not only necessary to have the general foreman issue signals on the approach of trains, but to have several men in the gang who, upon hearing the whistle and seeing the signal given by the general foreman, will take immediate action to execute the order. Also, when talking safety to the gang, an effort should be made to teach them the necessity of looking both ways before stepping upon any track. In addition to the protection on the ground, it is necessary to issue orders to trains to reduce speed and to be on the alert for men working on the track.

Flying Pieces of Steel

Injury from flying pieces of steel takes its toll each year. We have had four or five cases where men have been struck in the eyes, many cases where they have been struck on the legs or arms, and one case where a piece of steel went clear through a man's cheek. I recall one such accident in which a man lost his

*Abstract of a paper presented before the Maintenance of Way Club of Chicago.

Typical Examples*

life. In this instance, which took place on a Canadian road, a section man was engaged, with fellow employees, in changing a frog. After the work had started it was found that one of the nuts could not be loosened with a wrench and that it would be necessary to cut the nut off the bolt. A track chisel and spike maul were then brought into use, the foreman handling the spike maul while a section man, resting on one knee, held the track chisel. Three or four blows had been struck with the spike maul when a small piece of steel flew from the edge of the face of the maul and struck the section man. He straightened up for a moment and then collapsed, dying shortly afterward, the piece of steel having penetrated his overalls and shirt and entered his body between the second and third ribs of his right side, severing the pulmonary artery.

In the last year we have become greatly exercised over the number of accidents of this type that have occurred, and various means have been employed in an endeavor to stop such accidents. Circular letters discussing the necessity for keeping tools properly dressed have been distributed; the striking of track chisels, punches and claw bars with spike mauls has been prohibited; and the rule requiring the wearing of goggles while doing any cutting is being enforced. But all rules and instructions are for naught unless the supervisor or foreman in charge insists that they be complied with.

A Case of Poor Judgment

Another outstanding cause of injuries in the maintenance of way department is the improper handling of rails, ties, timbers, etc. Not long ago I investigated an accident wherein a bridge and building foreman was injured. His gang had loaded some bridge caps, about 15 ft. in length, on a push car and had taken them to one end of a bridge where they were to be used. At this point the shoulder of the roadbed was very narrow. The foreman took a timber bar, stuck it in the edge of the shoulder as a means of stopping the timbers from

Two Rules of Safety Are Being Violated in This View—A Spike Maul Is Being Used to Strike a Chisel and Neither Man Is Wearing Goggles

Now Wearing Goggles and With a Sledge Hammer in Place of the Spike Maul, These Men Are Doing the Job Safely. In addition the Collar on the Chisel Adds Another Safeguard

If the Bar Were to Slip the Man Sitting on It Could Easily Suffer a Broken Leg and Perhaps Other Injuries

This View Illustrates Proper Use of the Bar When It Is Used for "Nipping" Up Ties

By Standing Behind the Claw Bar the Man Is in Danger of a Chest Injury, While This Use of a Spike Maul Is Improper. Note Also the Absence of Goggles

In the View at the Left, the Man With the Bar Has Shifted to a Safe Position and the Sledge Has Replaced the Spike Maul. Both Men Have Put on Goggles

rolling down the embankment, and, after getting into position, he said: "All right, boys, roll 'er off." When the first timber struck the ground it bounced against the timber bar with such force as to cause the foreman to lose his balance, with the result that foreman, bar and timber rolled down the embankment. The foreman sustained two broken legs. The procedure employed in this case was uncalled for, the reason being that 400 ft. west of this point there was quite a wide shoulder where timbers could be rolled off without the possibility of their rolling down the embankment. Each bridge and building gang is furnished with a dolly for handling materials under such circumstances as this.

In another instance a section laborer had his toes crushed. The gang with which he was connected was handling a frog with a bar. While he was in the clear of the frog, he evidently wasn't thinking about the job he was performing. A shift was made which threw more weight on his bar than he had been carrying, with the result that the bar slipped out of his hands and came down on his toes. Safety shoes would have prevented this injury.

Violations of Safety Regulations in This View Are So Flagrant As to Require no Explanation

With the Men All on the Motor Car and With a Lookout in Both Directions, Safety Regulations Are Now Being Observed

Speaking about safety shoes—we have gone to quite some lengths in endeavoring to get our men to wear them. We now have about 7,000 employees wearing them, a great many of whom are in the maintenance of way department. In the last three years every man in the tie plant at Escanaba, Mich., has been fitted with safety shoes. Previously it was not uncommon to have an average of one reportable toe accident each week.

While I feel that everybody has made a sincere effort to stop track motor car accidents, we still seem to have quite a few. Ninety-nine per cent of all motor-car accidents are directly attributable to failure to comply with rules or instructions.

Not long ago I investigated an accident wherein four trailers and a motor car were damaged when they were struck by a passenger train while transporting 107 men from the point of work to camp. The general foreman was in charge of the motor car train. He approached and attempted to pass over an interlocking plant without complying with the instructions which are "to call the leverman and get permission for movement over the plant." He deliberately attempted to pass over this interlocking plant on the time of a first-class train and it wasn't until he saw the switch points lined against him that he realized his error. He turned, observed the passenger train coming at a high rate of speed, and called to his men to jump. They all did, but the four trailers and the motor car were wrecked.

Run-Away Motor Cars

In another case, a derailment was caused when a high-class freight train struck two push cars loaded with four rails. In this instance the section foreman failed to get a lineup or to provide proper flag protection while distributing the rails. The gang had arrived at a point where two of the rails were to be unloaded. To facilitate the unloading, the motor car was uncoupled. A few minutes thereafter one of the laborers said: "I hear a whistle; can that be train 380?" The foreman said: "You didn't hear any whistle." A few minutes later train No. 380 rounded the curve, moving at a speed of about 35 m.p.h.

One of the laborers secured and lighted a fuse, but it was too late. Two other laborers jumped on the cars and started them moving in an endeavor to save them from being damaged, but after they had started they looked around and saw the train so close behind them that they jumped off the motor car. They neglected, however, to shut off the gas or the spark and didn't realize what they had done until the motor car was out of reach. One of them then ran to the first telephone and called the train dispatcher who got in touch with an operator located about 20 miles north. The operator, in turn, called a section foreman and directed him to protect one of the busiest highway crossings in the state of Illinois and to overtake and stop the car after it had passed the crossing. This car passed over 19 highway crossings.

If you will require your section foremen to inspect their motor cars before starting out; to get proper lineups from the train dispatchers; to follow the flagging rules; to load tools and materials properly; to couple motor cars and trailers properly; to test the brakes; to maintain a constant lokout in both directions; and to approach all highway crossings prepared to stop—then you will eliminate at least 99 per cent of all motor-car accidents. I wish to em-

phasize that rules and instructions are of no use unless the officers and supervisors insist on compliance.

Another class of accidents in the maintenance of way department that give the safety man considerable worry are those involving falls from ladders, scaffolds, buildings, etc. Typical of such accidents was one involving a painter who placed the upper half of an extension ladder, the stiles of which were rounded at the bottom, on a wet brick platform, and then climbed the ladder and leaned slightly to the left. Of course, the ladder fell, causing the painter to break his pelvic bone and a wrist.

In another instance which I observed, a bridge and building man was cementing in a window sill from an 18-ft. ladder. As I approached this man, I observed that his ladder was about a foot and half off center. And then, while he was standing on the fourth rung from the top of the ladder, I saw him pull the ladder away from the building and throw his weight to one side in an effort to straighten it. This was an acrobatic stunt with dangerous potentialities.

Similarly dangerous was the position of a carpenter who was repairing the 45-deg. gable roof of a building. The eaves were 17½ ft. from the ground, and all this man was depending on to keep him from falling was the friction between his trousers and the roof.

Ninety per cent of all falls occurring in the maintenance department can be prevented if scaffolds are properly constructed, if the proper life lines are used, and if indulgence in acrobatic stunts is prohibited. These things can be accomplished only if officers and supervisors will, on their daily trips, correct unsafe practices or violations of rules when they see them.

Safety First involves, in the order given, the following elements:

1—Observation—of what is wrong or is likely to become wrong.

2—Education—to correct the situation.

3—Admonishment—a warning that must be heeded.

4—Discipline.

The safety man can function as far as observation and the education of officers and supervisors are concerned, but the education of the men and the elements of admonishment and discipline require the co-operation of other departments. If the safety man fails to receive this co-operation—in other words, if the supervisory forces of the railroad are not committed wholeheartedly to an insistence upon accident prevention—the safety man only achieves varying degrees of inefficiency. An old axiom says that ignorance of the law is no defense, and in railroading, if education is followed by admonishment, it is only fair that discipline follow infractions of the safety rules. Such discipline should be equitable and fair, and carry a penalty in each instance commensurate with all the circumstances involved in the accident. Consideration should be given to the question of so fixing discipline that the greatest benefits in furthering accident prevention will be obtained.

Left — When the Foreman Works He Cannot Supervise or Maintain a Lookout

Right—Here He Is Giving His Entire Attention to Supervision and Safety

I realize that it is the job of the roadmaster to get the work done, but this officer, the supervisor and the foreman will find that accidents are their responsibilities just as is any mistake in judgment or error that may be made in their departments. When going over the track, no roadmaster would fail to see a man using the wrong material or putting in a piece of track that did not comply with the specifications. The reason is that roadmasters have educated and trained themselves to notice such things at a glance, and if they are sincerely interested in safety they will educate and train themselves so that they will, at a glance, notice if a safety rule is being violated.

Some Suggestions

Listed below are a number of suggestions for promoting safety. It must be understood, however, that these suggestions pertain not only to the section foreman but to all of his superior officers. They are as follows:

1. You must be sincerely interested in the safety performance of your department.
2. You must know the predominating causes of accidents in your district.
3. You must be familiar with and understand all rules and instructions pertaining to safety.
4. You must take advantage of every opportunity to correct unsafe practices, conditions or violations of the rules.
5. If there are any rules that are impracticable, have them cancelled.
6. When an accident occurs, show interest by making an immediate and thorough investigation.
7. When an accident occurs, take the necessary action to prevent the occurrence of similar accidents.
8. In making safety talks to your men, make them interesting by giving details of accidents that have occurred on your own or other railroads. Allow the men an opportunity to express themselves.

An officer cannot be successful in accident prevention unless he really believes in safety. If he cannot answer yes to the question "Do I really believe in safety?", he can hardly be successful in making anyone else believe in it.

In conclusion it may be stated that safety programs will yield results in direct proportion to the interest, spirit and leadership invested in them by the supervisory officers.

Arc-Welding Rail Ends— Some

The Electric Arc Produces Intense Heat

THE application of the electric-arc method to the building up of rail ends is of comparatively recent origin, having had its beginning about fifteen years ago. Experience with the method on the New York Central has been obtained during the last six years, and, with one exception, all work of this character has been done under contract. Equipment utilizing both alternating current and direct current has been used, producing in each case welds that are quite comparable in their various physical and structural aspects.

The types of rods available vary over a wide range, from plain high carbon steel to alloys in various combinations. Even stainless steel was tried on one road and has given a good account of itself after a period of five years, although it was quite costly. Electric welding rods also vary in that they are either virtually bare or uncoated on the one hand or have heavy and complex types of coatings on the other.

In early applications of arc-welding to rail ends there was a tendency to strive for extreme hardness, with the result that values up to 500 on the Brinell scale were not uncommon. Such metal, however, was quite brittle, resulting in chipping and quite a number of shell-outs. These experiences resulted in a realization that it is more desirable to produce welds that are tougher and therefore not so hard. A hardness of 400 Brinell is now considered ample; in fact, a hardness of around 350 should be satisfactory.

Cost or Quality?

There seems to be a tendency in some quarters—and this applies to all classes of welding—to emphasize the unit cost of the job rather than the quality of the completed welds. It should be borne in mind, however, that the expenditure of a few cents more per joint may mean the difference between good and indifferent results. There is no profit to be obtained in rewelding or repairing rail ends at short intervals. In fact, in view of the greater hardness of the welded area as compared with that of the body of the rail, the rewelding of repaired rail ends should not become necessary for some time, if, indeed, at all.

The electric arc, of course, produces an intense heat, resulting in rapid fusion of the metal. The speed of application of the weld metal can be controlled by adjustment of the welding equipment, and by altering the size and type of rod. Evidently opinion and practice differ considerably as to the proper type of pattern to follow in applying the metal to the rail head.

Necessary steps in the welding of rail ends are the grinding of the deposited metal to a true surface and the cross slotting or end chamfering of the rail ends. The latter step has the advantage of revealing any important defects in the rail at the point of maximum punishment under service.

The question has been raised as to whether, during the arc-welding of rail ends, sufficient heat is transmitted to the splice or joint bars to soften them. We, and others too, have investigated this question by removing bars and submitting them to tensile tests. The results of these tests indicate that no appreciable impairment of the tensile strength or other physical properties takes place.

Pre-Heating and Post-Heating

In connection with the arc-welding of rail ends, experience has indicated the desirability of pre-heating the metal to some 600 to 700 deg. F. and post-heating it about the same amount. Pre-heating the rail ends aids in preventing checking and the consequent cracking out of zones on or near the surface, while post-heating slows down the cooling of the metal through the secondary brittle zone and also acts as a strain reliever.

In regard to failures, such as chipping, shelling, etc., there is no object in denying that they have occurred, for such a statement would be contrary to the facts. The percentage or number of such failures varies with many factors. Important among these are the type of traffic to which the repaired rails are subjected and the human factor, the latter being quite a controlling influence. Some failures have developed where arc welds were

*Abstract of a paper read before the Maintenance of Way Club of Chicago.

e Pertinent Considerations*

By C. B. BRONSON
Inspecting Engineer, New York Central, New York

applied over old gas welds which had not been burned out to a sufficient depth. Another cause of failure is the practice of going back and hastily applying small deposits of metal on cold steel because of some minor casting defect which becomes visible after the weld has been ground. Since small deposits applied in this manner are generally extremely hard they develop into cracked-out areas and, therefore, do more harm than good. Many failures in arc welds are attributable to this practice of "patching."

It should be borne in mind that the building up of rail ends by welding is primarily a process involving the application of cast metal to rolled material. However, most defects of castings are avoided through use of the proper rods and practices, with the result that the surfaces obtained are smooth and have few blow holes or cavities. Where such defects do appear it is better to leave them alone than to make hasty patches on the cold rails.

Some failures develop because of the greater hardness of the metal where the run-off from the weld joins the parent or normal rail-head metal. Scleroscope tests made with a large number of rail ends have indicated that the hardness in this zone is as much as 15 to 25 points higher than that directly at the rail end. Hence it is clear why a rather thorough preheating of the rail ends may be advantageous as an aid in creating a more nearly uniform hardness throughout the welded area.

When to Weld

What criteria should be used in determining whether the rail ends in a given stretch of track need to be welded? Apropos of this question, I believe that the basic cause for a large proportion of so-called bad riding joints is not true batter but the effect created by loose-fitting and worn bars. Frequently the difficulty can be corrected by changing or reversing the bars or by applying shims. In any event it is desirable, if the best results on major operations are to be obtained, to correct any defects in the joints before the welding is done. If this is not done until afterwards, an undesirable situation may be created at the joint. To reiterate, much alleged batter is not batter at all but joint bar trouble, in which event the joint can be smoothed off in a satisfactory manner without welding by correcting the out-of-level condition and by doing a small amount of surface grinding.

The introduction of arc-welding as a means of building up battered rail ends dates back more than a decade. In this article Mr. Bronson traces the development of the process in this field, discusses some considerations influencing the quality of the welds and raises a number of questions concerning the necessity of building up rail ends. He also discusses the heat-treatment of rail ends by the electric process.

Some roads with a relatively moderate traffic density have resorted to the building up of rail ends on rail that has had only about three or four years of service. Something must be basically wrong if the repair of rail ends is required after such a short period of service. Under average traffic conditions rail that has been properly laid and maintained should not require repair before at least eight to ten years have elapsed.

These points are not mentioned with the object of discouraging the building up of rail ends. The point is that it is necessary to give adequate consideration to the various phases of the proposition, including the condition of the track structure, particularly the joint bar assembly.

As to rate of batter, our experience indicates that there is no straight line ratio or type of curve that may be utilized to indicate the influence of traffic density. There are sufficient variations in the track structure from point to point to make a material difference in the rate of batter at the rail ends. In a given stretch of track the rate of batter actually varies over a considerable range. In some instances, because of the slight amount of the batter at many of the joints, it seems reasonable and justifiable to spot-weld only.

To my knowledge there is only one company engaged in the end hardening of rail ends by the electric process and I do not know of any railroad that has engaged in this type of work with its own forces. The first end-hardening of rail ends by this process was done in the field, using three separate machines, one to preheat the rail ends, another to flash or oscillate the arc across and lengthwise of the rail ends, and an oil-spraying device for the quenching operation. Various devices were incorporated in these machines from time to time to insure uniformity of the treated metal by the close control and timing of the three steps in the process. The apparatus was subsequently modified slightly and used at two or three rail mills for the end hardening of new rails.

A New Method of Treating Rail Ends

Information from a reliable source indicates that an induction method of heat treating rail ends is about ready to be placed in commercial use, and will be applicable in both the mills and the field. Heat produced by the induction method should be more uniform and subject to better distribution than that from the arc, and at the same time there should be less likelihood of burning the surface of the metal or of causing scaling.

Our experience with the end hardening of rail ends with the arc has been limited, and has been confined

to field applications. Three years ago we heat-treated the rail ends at 1,500 joints in groups of 500, most of which were situated in tangent track carrying fast trains. Although there are many checks or cracks at various places in the running surfaces of these welds, only two or three actual shell outs have occurred to date. The appearance of surface seams caused some objections to be voiced but most of these seams have since been rolled out, and have not proven troublesome or injurious.

Comparable stretches of track with treated and untreated rail ends have been checked periodically for batter, but the difference so far is slight, representing about 1/128 in. in favor of the treated ends which have a Brinell hardness of about 400. Moreover, the length of batter is somewhat longer for the unhardened ends. We have not observed any tendency for the metal to abrade—some prefer to say batter—just beyond the hardened zone of metal.

Field or Mill?

There has been some discussion of the relative advantages of hardening rail ends in the field and of treating them at the mill. Certain obvious advantages are involved in doing the work at the steel mill, including more accurate control and the opportunity which is afforded of varying the treatment in accordance with the carbon content or chemistry of each heat of rails; but perhaps the most important advantage involved in treating rail ends at the mill is that the treatment is done before any traffic has passed over the rails. Work in the field is sometimes delayed, in which event a certain amount of initial batter or flow occurs before the rail ends are heat-treated.

Rail steel must be treated with extreme care; temperature and quenching conditions, for instance, must be closely controlled. Of necessity the work usually must be done under conditions far from ideal, that is out-of-doors in all kinds of weather—this being true of both mill and field treatment—and if it is to be accomplished economically it must be done in a relatively short time, generally in a few minutes. Contrast this, let us say, with the heat-treatment of automotive or locomotive parts where the closest control of conditions is recognized from experience as being necessary.

Batter conditions, so far as we are concerned, are not as serious as some probably believe. For the time being, therefore, we have deferred any large-scale heat-treatment of rail ends. In arriving at this decision we also took into account that an extensive investigation is now in progress at the University of Illinois, which will bring out many pertinent facts covering the entire problem. This investigation should carry great weight in any evaluation of the efficacy of the various types of treatment in preventing rail-end batter.

What Treated Ties Mean to the Rock Island*

By Robert H. Ford

Chief Engineer,
Chicago, Rock Island & Pacific

THE Rock Island was a pioneer in the use of treated timber. In 1860 it built a Howe truss bridge of 8 spans, each 150 ft. long, with timber treated by the Burnettizing process; 22 years later the timber in this bridge was found to be in fair condition. Again, in 1882, the engineer maintenance of way reported the results from two lots of ties, one treated by the Burnettizing process and the other by the creosoting process. The first lot consisted of about 2,000 soft-wood ties, subjected to the Burnettizing process, and laid in the main track just west of the Englewood (Chicago) station in November, 1866. The greater portion of these ties were of hemlock and the remainder of pine, tamarack and cedar. The examination in 1882 disclosed that at least 75 per cent of these ties were still in track and in the opinion of the engineer maintenance of way were in such a state of preservation that they would remain in service two or three years longer. The second lot consisted of about 5,000 hemlock ties, subjected to the creosoting process, and laid in the second main track just east of Washington Heights (103rd street) station in Chicago, in 1872.

While, in the light of present-day methods of treating ties, the work on these earlier ties was somewhat crude, nevertheless it became increasingly evident that the desired objective of extending tie life was in sight, and the Rock Island, with other railroads, became an important contributor to the study and development of preservative methods for timber, so much so that in 1886 a contract was made with Joseph B. Card and Ostave Chanute for the treatment of 400,000 to 500,000 hemlock and tamarack ties per annum, using the zinc tannin process. This contract was later extended to November, 1903. Another contract was made in 1900 with Edward Ayer for the treatment of 200,000 Texas pine ties per year for 10 years, using the zinc-glue-tannin process.

The results obtained from these ties, together with the growing information on the subject generally, re-

*Presented before the Users' Day session of the 34th annual convention of the American Wood-Preservers' Association at Chicago on January 19.

Treatment Has Reduced Tie Renewals on the Rock Island

sulted in the Rock Island beginning the use of creosoted ties in 1908. At that time the ties in track were zinc-treated red oak, hemlock and southern pine, untreated white cedar and white oak, and a small percentage of untreated longleaf yellow pine. The average service life of these ties was between 10 and 11 years. The greater portion of the ties treated with chloride of zinc were softwood, making it necessary to use untreated white oak ties on curves.

Under the new contracts for treatment with creosote, it was possible to secure a large percentage of red oak and gum ties suitable for use on curves and heavy traffic lines, southern yellow pine ties being used only on tangents.

As might be expected there was little decrease in the number of ties used per mile for renewals during the first 10 years that creosoted ties were used, but the renewals from 1918 to 1937 declined to an average of 122 ties per mile, being equivalent to a reduction below the average for the period from 1908 to 1917 or 117 ties per mile, compared with 285 in 1908. The average renewals per mile from 1908 to date were as follows:

1908	—285 ties per mile
1908 to 1912	—256 " " "
1913 to 1917	—224 " " "
1918 to 1922	—164 " " "
1923 to 1927	—138 " " "
1928 to 1932	—112 " " "
1933 to 1937	— 77 " " "

Disregarding for the moment the cost of untreated ties, and also the fact that at the present time it would be impossible to secure a sufficient number of white oak or cedar ties to take care of our requirements, the saving in labor alone required to insert the additional ties that would have been required on the basis of the 1908 to 1917 renewals represented a decrease in operating expenses of $505,065 a year.

Records of creosoted red oak ties inserted in test sections in 1912 indicate an average life of more than 25 years. These ties were 6 in. by 8 in. by 8 ft., none adzed or bored for spikes prior to treatment and very few of them protected against rail wear by tie plates. Since 1923 the greater portion of the ties used on our heavy traffic lines have been 7 in. by 8 in., or 7 in. by 9 in. by 8 ft., all adzed and bored for spikes prior to treatment, and protected by tie plates applied at the time of insertion. These ties should give an average life of 30 years or more. Heavier rail and adequate ballast should result in securing maximum tie life.

According to the Bureau of Railway Economics, the estimated number of ties in track in the Rock Island Lines on December 31,, 1936, was 31,533,669, on a mileage of 10,473.75. Statistics show that the average life of an untreated tie is from 5 to 7 years, but that under good maintenance conditions this can be extended to 10 years, while there is ample evidence to support the assumption that the life of a tie treated with 7½ lb. of creosote to the cubic foot of timber can be extended to 25 or more years. In fact, based upon experience in Europe, the indications are that the service life can be extended even longer. It will be noted that this gives a service life 150 per cent greater than the life of an untreated tie.

As stated previously, it would be impossible to secure sufficient white oak, cedar or other suitable native timber to meet the present-day requirements of the railroads if untreated ties were still in use. However, assuming that untreated ties were still in use, this would mean that our annual tie requirements on the Rock Island alone would be about 3,154,000 ties. By way of comparison, our annual requirements of treated ties, with an average estimated life of 25 years, would be about 1,230,000 ties. This latter figure is substantiated by the fact that our actual annual tie insertions for the last 20 years have averaged 1,235,000 ties. In other words, our present savings from the use of treated over untreated ties are as shown in the table.

Service Result from the Use of Treated Ties

Annual Untreated Tie Requirements		
3,154,000 ties at 60 cents each	$1,892,400	
Transportation—283,860 tons at $5.25 (based on an average weight of 180 lb. per tie and an average haul of 750 miles)	1,490,265	
Labor inserting at 40 cents each	1,261,600	
Total annual cost of untreated tie requirements		$4,644,265
Annual Treated Tie Requirements		
1,230,000 ties at $1 each	$1,230,000	
Transportation—110,700 tons at $5.25 (Based on an average weight of 180 lb. per tie and an average haul of 750 miles)	581,175	
Labor inserting at 40 cents each	492,000	
Total annual cost of treated tie requirements		2,303,175
Annual savings from using treated ties as compared with untreated ties		$2,341,090

Keeping Termites Out of Buildings

THE Committee on Diversified Uses of Treated Wood, of which E. P. Gowing, American Wood Preserving Company, was chairman, presented a code of recommended practice for the use of pressure-treated lumber in protecting buildings against decay and termites at the convention of the American Wood-Preservers' Association, Chicago, on January 19.

For protection against decay and termites, lumber shall be treated under pressure in accordance with the specifications of the American Wood-Preservers' Association according to use and location as follows:

1. When in contact with ground:

Foundation timbers, mud sills, plates, supporting posts, pillars, footing and all other structural members in contact with the ground shall be pressure treated with coal-tar creosote, with a net retention of 8 lb. per cu. ft.

2. When not in contact with but within 18 in. of the ground below first floor on foundations:

Joists, bridging, sleepers, headers, sills, plates and all other structural members not in contact with but within 18 in. of the ground and below the first floor when embedded in or laid on concrete, masonry or timber foundation shall be pressure treated with coal-tar creosote, with a net retention of 8 lb. per cu. ft., or with zinc chloride, with a net retention of ¾ lb. per cu. ft.

3. When not in contact with but within 18 in. of the ground below first floor, other conditions:

First sub-floor nailing strips, siding and sheathing within 18 in. of the ground, stairs, partitions, door and window frames and casings, studding, lath and coal bins in basements and cellars, studs, porch flooring, rails, posts and steps shall be pressure treated with zinc chloride, with a net retention of ¾ lb. per cu. ft.

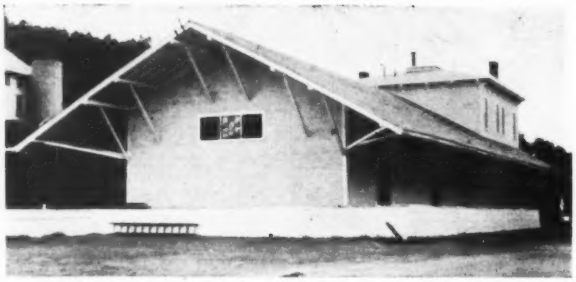
4. Nailing strips:

All nailing strips embedded in concrete or masonry shall be pressure treated with coal-tar creosote, with a net retention of 6 lb. per cu. ft., or with zinc chloride, with a net retention of ¾ lb. per cu. ft.

Lumber treated with zinc chloride shall be air seasoned or equivalently kiln-dried after treatment and before installation, to a moisture content approximating conditions of use.

Maximum protection against termite attack is obtained through the use of pressure treated wood in conjunction with the use of metal shields and other recommendations of the United States Bureau of Entomology and Plant Quarantine.

The Freight House as It Looked for 67 Years



The Same House as It Looks Today

Old Freight House Gets Face Lifted

Cedar-grain asbestos-cement siding shingles give old board and batten walls a modern durable surface

SINCE 1870, the Delaware & Hudson has periodically painted its freight house at Cooperstown, N. Y., but today, having refaced the entire building with Cedar-grain asbestos-cement shingles, it expects that its surface maintenance problem on this structure is at an end. At the same time, the new facing, which can be washed readily to renew its freshness, gives a relatively modern appearance to a structure which had long been outmoded, and which could not be brought into harmony with the more recently constructed buildings in the town, even though kept well painted and in a good state of repair.

Vertical Siding

The old freight house, entirely of frame construction, with a two-story office section 34 ft. by 28 ft. adjoining a one-story shed approximately 75 ft. by 28 ft., was reminiscent of the period in which it was built. The office section had distinctly Victorian lines, while the eaves of the shed roof extended out over the full width of side and end platforms, as was not uncommon in freight house architecture of an earlier day. In its setting in the town, these architectural features were not particularly objectionable, but one feature which was somewhat offensive was the vertical board and batten facing which enclosed the entire building. In view of the antiquated appearance which this siding gave to the structure, and the further fact that it was badly weathered and both difficult and costly to paint, it was decided to reface the building with Cedar-grain, asbestos-cement siding shingles. It was felt that these shingles, light gray in color, would give a pleasing effect to the building, and, being inherently durable in character, would solve the siding and painting problem for many years. At the same time, applied directly over the old siding on an asphalt-saturated building paper, it was known that the new siding would increase the insulating value of the walls, and, at least in the office section, would simplify the problem of winter heating.

The shingles employed come in panel or strip form, 24 in. wide, 12 in. long, and about 3/16 in. thick. In addition to their distinct surface grain structure, they have a wavy lower edge, which breaks the harsh horizontal lines of ordinary shingles laid in regular courses. Each shingle was provided with six nailing holes, three along the top and three along the bottom, although, with a special punch, additional or respaced holes can be provided in the field as conditions may require.

In applying the shingles, the first step was to remove the old vertical batten strips in order to give a smooth continuous bearing for the new facing. Then, after applying a 15-lb. asphalt-saturated felt over the old siding, the shingles were laid up with 10½ in. to the weather. Large head roofing-type galvanized nails, about 2-in. long, were used along the top of the individual shingles, where they were obscured by succeeding courses, while cadmium-plated bronze nails, 1¾ in. long, with a ⅛-in. head and a ring barb, were used near the bottoms of the shingles where the nail heads are exposed to the weather.

Shingles Applied Rapidly

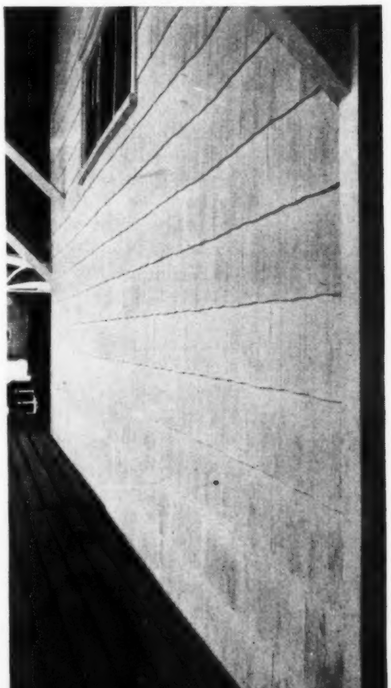
Because of the size of the individual shingles, the new siding was applied rapidly over the larger unbroken areas of the freight house, and even fitting them around doors and windows presented no problem, a special shearing knife being employed to cut the shingles to the size required. Only the fitting of the wall facing around the many roof braces required a rather disproportional amount of time, but, employing the special cutter, the work was done neatly and without special difficulty.

Along with the resurfacing of the old freight house, the wooden trim and doors were repaired and painted, new roof gutters were applied, the

Extensive Cutting Was Necessary to Fit the Siding Around Openings and Roof Braces

entire interior of the office section was redecorated, and such other general repairs were made as were required to put the building as a whole in good condition. Altogether, a total of 41½ squares of the new siding were applied, this work alone requiring a total of 872 man-hours of labor, and costing approximately $750 for labor and material. With a less complicated architecture and fewer openings, and with greater experience among the forces in applying this type of siding, it is felt that the labor item involved, which, incidentally, included a cook's time, could have been reduced materially.

Since completing the work on the Cooperstown freight house, the road has undertaken the refacing of two branch-line station buildings on its Champlain division with the same type of asbestos-cement shingles. These stations are at Ausable Forks and Peru, N. Y. All of this re-siding work is being carried out by the building forces of the road under the general direction of H. S. Clarke, engineer maintenance of way. The work at Cooperstown was done under the supervision of F. P. Gutelius, division engineer, and J. A. Doyle, bridge and building master. The siding material employed was furnished by the Johns-Manvlle Company.



A Close View of the Cedar-grain Asbestos-Cement Siding

Progress? Lots of It

(Continued from page 88)

more lasting work. The mechanical cleaning of ballast originated on our Pittsburgh division a number of years ago. Now we have machines to tamp track, adze ties, bolt and unbolt joints, drive and pull spikes, burn weeds, mow the right-of-way, saw and frame bridge timbers, grade banks and bore holes in almost anything. A recent development is a grinder to smooth the surface of the rail where corrugations and burns exist. Most maintenance operations are now mechanized. Several notable exceptions are the lining of track, except as provided by special forms of jacks, and the renewing of ties. Many of these machines are highly developed, but there are a great number which are in a transition and development state and there is still a great field for advancement along these lines. The tendency is toward machines which operate without blocking the tracks. There is also a tendency toward doing many small jobs, formerly done by hand, by the use of portable power plants.

Track Awards

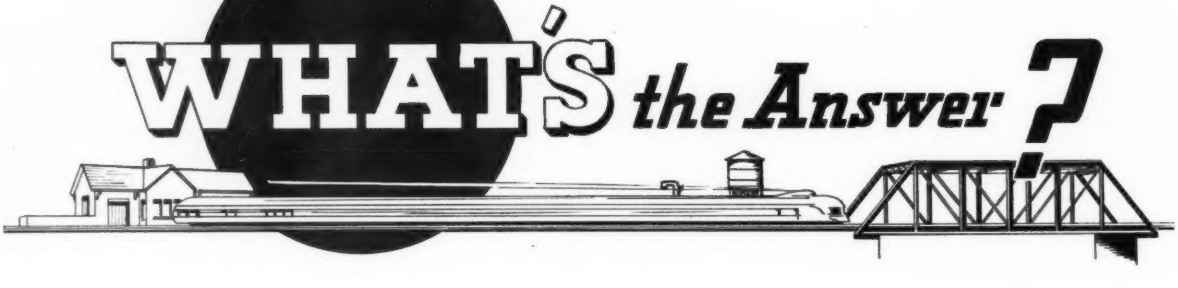
(Continued from page 91)

East Liberty, Pa. Eastern division—C. R. Montgomery, Mansfield, Ohio. Panhandle division, main line—J. C. Dayton, Newcomerstown, Ohio. Panhandle division, branch line—M. C. Fox, Wheeling, W. Va. Pittsburgh division, branch line—M. J. Miller, Barnesboro, Pa. Conemaugh division—F. E. Flynn, Kittanning, Pa. Monongahela division—O. L. Fisher, Youngwood, Pa. Buffalo division—A. M. Harris, Olean, N. Y. Renovo division—I. S. Pringle, Emporium, Pa. Cleveland division—Joseph Conlon, Alliance, Ohio. Erie and Ashtabula division—M. S. Smith, New Castle, Pa.

On the Western Region

Western Region—Fort Wayne division—P. O'Connor, Crestline, Ohio. St. Louis division—M. E. Boyle, Greenville, Ill. Columbus division—D. Lewis, Richmond, Ind. Cincinnati division—H. W. Manning, Xenia, Ohio. Chicago Terminal division—P. W. Triplett, Chicago, Ill. Logansport division—John Nowviski, Crown Point, Ind. Toledo division—C. V. Frish, Carrothers, Ohio. Grand Rapids division—A. W. Miller, Petoskey, Mich. Indianapolis division—J. H. Ault, Jeffersonville, Ind.

The New "City of San Francisco" on the Southern Pacific in the Sierra Nevada Mountains



Material Stocks in Large Yards

Should a stock of track materials be maintained at a large yard? Why? If so, what materials should be carried? If not, how should they be obtained?

For Emergencies Only

By H. F. Fifield
Engineer Maintenance of Way, Boston & Maine, Boston, Mass.

If a large yard is not adjacent to the stores department stock, a sufficient supply of frogs, switches, guard rails, switch stands, etc., to take care of emergencies should be kept on hand to avoid the probability of delay in case of accidents or other forms of damage to turnouts. On the Boston & Maine we keep this material neatly stacked on emergency racks, the stock to be held at each point having been agreed on and so assigned, with definite understanding that no heavy material is to be kept on hand at any other points on the railway. Under this arrangement, the amount of heavy material on the line is greatly reduced; yet sufficient material for emergencies is available at the points where it is most likely to be required.

Based on Size of Yard

By R. L. Simms
District Maintenance Engineer, Chicago, Burlington & Quincy, Galesburg, Ill.

Any consideration of this question must take into account the importance of the yard and how far it is away from the general supply of track materials. An emergency stock should be available, including only switch points, frogs and guard rails to provide reasonable protection against delays in case any of these units are damaged in service. The number to be carried should be based on the number of turnouts and the range of frog angles. The emergency stock should be kept where it is most easily accessible to reduce delays to the minimum when it is needed. When any item is removed from the emergency stock, a report should be made to the proper officer and a requisition should be made for its immediate replacement.

Co-operation Needed

By Dave Kirkland
Bridge and Building Department, Chicago, Rock Island & Pacific, Fairbury, Neb.

While there should be no question as to the advisability of keeping an emergency stock of track materials at large yards, there is often considerable difference of opinion as to what constitutes such a stock, that is, the individual items that should be included and the number of each. If properly supervised, such a stock may be not only convenient but economical; if not, it may be just another reason for buying red ink. Material stocks should be considered to be of only two classes, those for current use and those held for emergencies. Emergency stocks should be held to the lowest practical limit consistent with the necessity, in this case, for uninterrupted yard operation, and with the probability that it will be needed.

A decision on these points calls for whole-hearted co-operation between the stores department and the maintenance officers involved. To arrive at an agreement as to what constitutes a reasonable emergency stock the records of emergency calls for each item at the yard under consideration for one or preferably two years should be studied carefully and without prejudice by the representatives of both the stores and the maintenance departments. They should

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in April

1. What effect do the higher speeds of today have on track maintenance? Why? Do the types of motive power and cars make any difference?

2. What type of pump is best suited for use in foundation cofferdams? Why? If centrifugal pumps are used, should they be belt-driven or connected directly to the power unit?

3. What is the best method of insuring accuracy in obtaining the temperature of rail as it is being laid?

4. Is there any advantage in surfacing wood platforms with bituminous materials? If so, what? How and when should it be applied?

5. What practical measures can be taken to prevent the formation of soft spots in cuts? In embankments?

6. How does one go about replacing a post in the frame of a wooden tank?

7. Is there any advantage in making an inspection of ties after they have been taken out of the track? Why? Who should make the inspection? What record should be kept? How can it be used?

8. Is it practical to shorten loose eye bars in a truss span by heating them? If so, how should this be done? If not, how can they be shortened?

keep in mind that emergency requirements are very real and are essentially important and also that surplus stock is a liability rather than an asset, since it is subject to little if any turnover.

Conditions Differ

By T. J. Leonard
Track Supervisor, Erie, Hackensack, N.J.

A large yard should carry a sufficient stock of the essential track materials adequately to cover emergency requirements, both for the yard itself and to protect adjacent outlying points. This stock should include the safe minimum of frogs, switch points, guard rails, switch stands, switch and connecting rods, rails, ties and switch timber, in the various sizes and weights that are required. A fair quantity of incidental small track material should also be kept on hand, such as angle bars, spikes, tie plugs, bolts and spring washers.

These materials should be stored in an easily accessible place, centrally located, and should be piled neatly according to the standard of the road, segregated as to sizes or weights. However, care should be exercised to avoid maintaining an excessive stock of any class of material. A careful analysis should be made of past requirements over a sufficient period to be typical, and due consideration should be given to the general condition of the yard.

Maximum Rate for Water Delivery

What is the maximum practical rate at which water can be delivered to locomotives? What considerations determine this?

Several Factors

By C. R. Knowles
Superintendent of Water Service, Illinois Central, Chicago

A number of factors must be given consideration in determining the rate at which water can be delivered to locomotives. Summing them up, it appears that 5,000 gal. a minute is the maximum practical rate. The principal factors which must be taken into account are (1) water hammer as affected by valve closure; (2) the tendency of the water column to lift out of its base when the water flows through it at high velocity; (3) the tendency of the spout to lift out of the manhole at high rate of delivery; and (4) the displacement of air from the tender by the inflowing water.

The largest water column now on the market has a diameter of 12 in. As a rule, 12-in. water lines are used to supply these columns, provided the column line is not more than 300 ft. long, 14-in. pipe being used for lines of greater length. A 12-in. water column with 300 ft. of 14-in. pipe requires a head of 30 ft. to deliver 5,000 gal. per min. The same column and size of pipe require a head of 40 ft. to deliver 5,000 gal. through 500 ft., and a head of 60 ft. is required to deliver 5,000 gal. through 1,000 ft. of 14-in. line and a 12-in. water column. If the distance is 1,600 ft. an 80-ft. head is necessary to make the same delivery through the same size of pipe and water column.

Where the delivery is greater than 5,000 gal. per min., the velocity of the water becomes so great that any saving in time by reason of taking water at the higher rate may be offset by the additional time required to close the valve against the velocity head to avoid excessive water hammer. This high velocity will also have a decided tendency to lift the column out of the base and might make it necessary to design a special column to resist this tendency.

Again, the delivery of water at a rate of 5,000 or more gallons a minute will necessitate a rather accurate adjustment of spout elevations at the time of taking the water to avoid the lifting of the spout from the manhole, and this in turn will require an almost uniform height of tenders. For example, if the spout and column outlet were adjusted for a tender manhole height of 11 ft. above the rail, it would be impracticable to deliver water from the same column to any engine tender having a manhole height of 8 ft. or 8 ft. 6 in. A delivery rate of 5,000 gal. will, in many cases, necessitate a larger manhole opening than is now usually provided to allow for escape of the air displaced by the water as it enters the tank.

These comments do not apply in whole to delivery directly from the tank through a tank spout. There is a greater tendency for the tank spout to lift from the manhole under high velocities than for a water-column spout to do so. While there will be no water hammer, within the usual meaning of the term, from valve closure at this high rate of delivery, there will be a marked increase in the shock caused by the closure of the lift valve ordinarily used with tank spouts. For this reason, it will probably be necessary to install a balanced valve to permit a slower rate of closure, thus sacrificing at least a part of the time saved by the faster delivery.

Consideration has been given in some quarters to the construction of 14-in. and even 16-in. water columns. It is a serious question, however, whether water columns larger than 12 in. are practical, because they would be very cumbersome to handle and would necessitate refinements in bearings, as compared to present designs, to permit them to be swung over the locomotive tender. The objections that have been mentioned to deliveries higher than 5,000 gal. a min. apply to columns larger than 12 in., particularly with respect to the tendency of the spout to lift from the manhole, or from its base and the displacement of air from the tender.

Should not Be too Great

By District Engineer

Transportation officers are sometimes inclined to press for a higher rate of delivery of water to locomotives to reduce the time required to take water. Two recent developments have tended to increase this pressure, namely, tenders of larger capacity and faster train schedules. While existing delivery rates vary somewhat widely, let us assume it to be 2,500 gal. per min. At this rate, if the engine tank holds 15,000 gal. and is practically empty, it will require 6 min. to fill it. As passenger trains on fast schedules can usually do station work in less time, there is some additional delay to complete the taking of the water. If this delivery can be increased to, say 5,000 gal. a min. the period required to take water will be about the same as that for the station work, and this is the objective that is sought, for minutes count on fast schedules.

Increasing the delivery rate raises several difficulties, however. Our larg-

est water columns are 12 in. and I am not aware that larger sizes are available, in fact, I am not sure that I would want them if they were. Let us assume a rate of 5,000 gal. a min., as this is the one that has been discussed with me. This rate would require a flow of 666 cu. ft. a min. at a velocity of approximately 14 ft. per sec. through the column. After entering the column this water must make a 90-deg. turn to reach the spout, and it is obvious that it will exert a decided lifting effect, tending to tear the column from its base. The magnitude of this force for any case can be determined by the formula

$$T=2AP \sin \tfrac{1}{2} a$$

in which T is the lifting force, A is the effective cross-sectional area of the column, P is the water pressure and a is the angle of deflection, in this case 90 deg. There is also another point of deflection at the mouth of the spout, which will tend to lift it from the manhole.

Another difficulty to be overcome will be the escape of the air from the tender as it is displaced by the incoming water. The movement of this volume of air is likely to be accompanied by considerable spray which will make it quite uncomfortable for the fireman, particularly in cold weather. This should not be a major problem but must be taken into account.

Another problem of still more importance is the closure of the water-column valve. Rapid closure is out of the question, since it would produce severe water hammer. To avoid water hammer, the rate of valve closure must be low, and this will in large measure offset the advantage with respect to time of the faster delivery.

While I have no hesitation in saying that a delivery of 5,000 gal. a min. can be made successfully, I do not favor so high a rate, and would prefer to keep the maximum to about 4,000 gal. I believe, however, that 5,000 gal. is about the practical limit with present delivery equipment. I do not favor the suggestion of larger water columns of the present design, for the 12-in. size is cumbersome enough. Any increase in size will require refinements in design and operation not hitherto necessary.

How Does Rail Affect Costs?

In what ways and to what extent does heavy rail affect track maintenance cost?

Determination Complicated

By J. M. Farrin
Special Engineer, Illinois Central, Chicago

Among the factors which influence the cost of track maintenance as a result of variations in the weight of rail are (1) strength of the rail; (2) interest on the cost of the rail; (3) depreciation, based on the value lost in the first location; (4) labor involved in track laying and surfacing, including periodic renewal of the rail; and (5) tie renewals which are made necessary by mechanical destruction.

The standard weights of rail now in general use on American railways are 85 lb., 90 lb., 100 lb., 112 lb., and 131 lb. There is also a considerable mileage of rail sections weighing 110 and 130 lb., but as these have been superseded by the 112 and 131-lb. sections and as the 152-lb. section is used by only one road, only the five weights first mentioned will be considered.

At first thought it would seem to be easy to determine from data at hand the effect of each weight of rail on costs, but this is not so because the problem is complicated by differences in maintenance standards, traffic densities and roadbed conditions. Lately, the practice of building up rail ends has become so nearly universal that conditions away from the joint are becoming the controlling factor in the replacement of rail, and this trend gives the heavy section a more favorable rating.

One of the difficulties encountered in determining comparative costs arises from the fact that funds are not always available to renew rail and ties at the time this should be done, while other forms of maintenance are deferred for the same reason, thus reflecting untrue costs when analyzed later. These figures are still further confused by the absence of equipment to measure, even with a fair degree of accuracy, the comparative performance of the different weights of rails in the same location under identical traffic.

What is wanted is the total cost for each size of rail for the entire period of its life in its first location, for identical performance under the same roadbed and traffic conditions. As such costs are not available, in selecting the size of rail best suited to their needs, maintenance officers must use their judgment, based on experience, for each particular location.

To assist in arriving at conclusions, a theoretical analysis has been made of the effect of each size of rail on the general roadbed condition, and it is assumed that this effect bears a certain relation to maintenance costs over the period in the first main-line location. On this basis, and under identical roadbed and traffic conditions, the relative costs are as follows:

Weight lb.	Interest	Depreciation	Track laying and surfacing	Tie cost
131	1.00	1.00	1.00	1.00
112	0.85	1.08	1.14	1.01
100	0.78	1.23	1.30	1.02
90	0.70	1.33	1.43	1.04
85	0.68	1.52	1.53	1.05

To apply this table, the costs must be known for one size of rail for each of the items shown. Then by applying the ratios shown, the costs for any other weight of rail can be computed for the same performance and traffic and roadbed conditions. It will be noted that this method is independent of traffic density, and that comparative strength has not been considered.

As an example, if a district is laid with 90-lb. rail and it is desired to see how 112-lb. rail will compare with it in annual cost, the comparison would be: Interest charges, $\frac{85}{70} = 1.22$, or 22 per cent greater for the 112-lb. rail. In the same way depreciation will be 0.81, or 19 per cent less; track laying and surfacing, 0.80 or 20 per cent less; and tie cost, 0.97 or 3 per cent less, as compared with the 90-lb. rail. Knowing these costs for the 90-lb. rail, those for the 112-lb. rail can be determined by applying the percentages shown.

Easier to Enumerate

By A. N. Reece
Chief Engineer, Kansas City Southern, Kansas City, Mo.

It is far easier to enumerate the ways in which heavy rail effects economies in track maintenance than it is to evaluate with accuracy the savings that accrue to each feature or the savings as a whole. Estimates of relative economies in track maintenance resulting from the application of heavy rail necessarily introduce assumptions into some of the fundamental equations, and while it

is believed that with judgment these assumptions can be determined rationally, when the results are translated into dollars, of necessity they lack the precision of pure mathematics. From the standpoint of economics this need not invalidate the conclusion, for practically all problems of an economic nature are subject to this frailty.

Some of the ways in which heavy rail affects track maintenance include the following:

1. It reduces lining and surfacing because of its greater stiffness both vertically and horizontally. There are indications that heavy sections require about half as much work of this character as light rail under the same conditions of speed, wheel loads and volume of traffic.

2. Heavy rail has longer life than light rail, thus producing economy in relaying, since the periods between renewals are longer. This is important on heavy traffic lines where delays to trains may be frequent.

3. Ties last longer under heavy rail since, owing to its vertical stiffness the concentrated wheel loads are spread over a greater length of rail, reducing the load on the individual tie. The larger tie plates used with heavy rail also add to tie life, and while this is not in itself a function of the rail, the practice of using large plates with heavy rail is almost universal. It would probably be possible to realize some of this economy by increasing the size of tie plates under light rail, but the amount is problematical. A large percentage of ties fail from mechanical action which is greatly increased by the wave action of the rail. The stiffness of heavy rail reduces the wave action, which of itself prolongs the life of the ties. Certainly, the reduced load per tie, the larger tie plates and the reduced mechanical action produce significant economies in ties. It is estimated that the life of ties under heavy rail will be approximately 20 per cent longer than under light rail when other conditions are identical.

4. Ballast will remain clean and intact under heavy rail longer than under light rail. Churning tends to drive dirt from the subgrade to the surface. The vertical movement of the tie under fast traffic acts as a blow, the intensity of which increases almost in proportion to the square of the vertical distance moved. Because of the stiffness of heavy rail, churning is reduced. The object is to keep the track at any point at a constant elevation; when low places in the track have to be raised it is because the ballast has been driven into the subgrade. After the raising of low spots has been continued over a period of time, the ballast section must be replenished, either in spots or over a considerable length of track, and the track must be surfaced out of face. This work is periodic and expensive. With heavy rail this will not be necessary as often as with light rail, the consequence being an appreciable saving.

5. The safety of heavy rail compared with light rail is indisputable. During the last decade, wheel loads have increased greatly for both cars and locomotives and during the same period the speed of both passenger and freight trains has more than doubled. These two factors have combined to reduce materially the factor of safety of light rails, with the result that life and property require the protection afforded by heavy rail.

6. While the following points do not relate directly to track maintenance, no discussion of the merits of heavy rail would be complete without mention of them. Traffic density, wheel loads and speed are factors that influence the economic selection of rail, and no formula can neglect any of them, notwithstanding the fact that they are variables and that they may exert a different influence in one case than in another.

Some economy is realized in the maintenance of equipment by the use of heavy rail. It is difficult to calculate with exactness what this saving amounts to in money, but there can be no doubt as to the validity of the item. There is also a saving in the cost of train operation because the stiffness of the heavier rail reduces the wave action, thereby causing less rolling friction.

Combining all of the foregoing and developing a rational, if not exact, determination, heavy rail is clearly justified for a traffic density of 4 to 5 million gross ton miles per mile of road.

In recent years the trend has been to rail weighing 112 lb., 131 lb., and in some cases to 152 lb. Generally speaking, the dividing point between light and heavy rail is 100 lb. to the yard. Those who have not had the opportunity to see moving pictures of the track structure under moderate wheel loads at a speed of 60 miles an hour would be amazed at the decrease in vibration as the weight of the rail is increased. Ranging from 85 lb. through various weights to approximately 130 lb., the increase in the stability of the track is marked as the weight of the rail is increased successively.

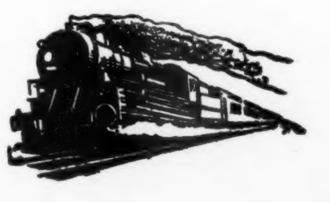
Portable Wood-Working Machines

What advantages, if any, are there in equipping bridge and building gangs with portable wood-working machines? Of what types? How should they be driven?

Reduce Manual Tasks

By A. L. Bartlett
Engineer Maintenance of Way, New York, New Haven & Hartford, New Haven, Conn.

A large part of the wood work performed by the bridge and building forces consists of sawing, boring, setting lag screws and tightening nuts. Any effort directed toward decreasing the number of manual operations on this type of work increased production and is, therefore, of material financial benefit. Our experience has been that electric tools are best adapted for the operation of saws and drills as the wire connections can be handled with greater facility than air hose. In addition, modern gas electric generators are manufactured in weights which make it practical for one or two men to move them—a very important factor in work of the character done by bridge and building forces.



One type of 1,500-watt unit weighs 86 lb. and operates a saw with a 3-in. cut and a 1½-in. auger simultaneously. A 2,500-watt unit weighing 130 lb. will operate a saw with a 6-in. cut, together with two 3-in. saws, two 1½-in. augers or one of each. Setting lag screws, running up nuts with socket wrenches fitted to the electric drills and emergency lighting are but three of the many uses for which this type of equipment is adapted. Every bridge and building gang on the New Haven is equipped with either a 1,500 or a 2,500-watt generator unit and a com-

plement of electric saws and drills suitable for the work on which the gang is engaged, and this has resulted in a material increase in production with fewer man hours.

Possesses Many Advantages

By District Engineer

Owing to limited appropriations for work equipment, substantially all of which are applied to machines for track work, our bridge and building gangs are not as well equipped with power units and portable tools as I would like to have them. Yet every gang has either an air compressor or an electric generator and some portable tools; otherwise we would have been seriously handicapped during the last seven or eight years, especially with respect to the maintenance of timber trestles. While we need a considerable number of portable tools, we are also in need of new power units, for those we have have been in service a long time and need to be replaced.

As I understand the question, however, it refers more particularly to stationary wood-working machines, such as planers, band saws, etc., which are light enough to make them portable, rather than to portable tools such as chain saws, wrenches, augers, etc. Several years ago I was in charge of a construction job which required a considerable amount of difficult form work for concrete. Electric power was available at one point but not elsewhere, and we were able to obtain two portable units, a tilting-table band saw and a planer for the gang at the first point, the planer being a combination machine with several extra heads for cutting molding, gains, etc.

The project contained two almost identical structures, the form work for the second of which was cut by hand, giving us an opportunity to compare the economic value of the machines. Records indicated that the saving in labor cost on the form work alone was more than sufficient to pay for the machines, there was less waste of material, the fitting was done much better and there was no delay in waiting for completion of the forms. Later, a gasoline-driven electric generator was obtained, the machines were set up in an outfit car and turned over to a building gang, which found them to be of distinct advantage, although I do not believe that further records were kept to determine their economic value in this service, although this information would have been of considerable value to the railroad.

Keeping Ditches Clear in Winter

To what extent should the section forces be required to keep surface ditches clear of ice and snow during the winter and early spring? Why?

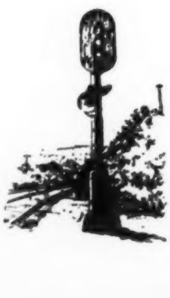
Depends on Weather

By P. T. Robinson
Engineer Maintenance of Way and Structures, Southern Pacific, San Francisco, Cal.

In sections where the temperature remains consistently low and the ditches become full of ice or hard frozen snow, I do not consider it essential to clean them out until the spring thaws begin. On the Southern Pacific there are many places where snowfall, sometimes quite heavy, occurs at relatively high temperatures, and here it is essential that the section forces clean the surface of snow and ice immediately. Water generally runs in the ditches beneath the snow, and a sudden fall in temperature causes ice to form, still further blocking drainage, usually most effectively. Blocked drainage results in water running beneath the snow, and water from melting snow, not having access to culverts, may seep beneath the track and into fills, with the possible result of soft track and settling fills.

For these reasons, it is essential that section gangs be required to keep their surface ditches clear of ice and snow, that this work be started immediately after the termination of every storm, and that it be completed as rapidly as possible.

Under no circumstances should accumulations of ice and snow be allowed to remain in the ditches to block the free flow of water through them.



Only a Minor Problem

Engineer of Track

Fighting snow and ice is only a minor problem on this road. We have not had a snow plow out for several years, and it is only occasionally that it is necessary to augment our regular winter force for the purpose of handling snow. Our surface ditches are cleaned during the summer and fall and it is the duty of our section forces to keep these ditches clear of snow and ice during the winter and in the spring, especially where there is a likelihood that accumulations will interfere with the free flow of water through them.

Ice and snow do not constitute a problem with us, for our forces, even when reduced to a winter basis are generally able to take such action as is necessary. On the other hand, if a situation does arise which they are not able to cope with, they are given the liberty of increasing the size of their gangs temporarily until the emergency has passed.

Conditions Vary Widely

By Engineer Maintenance of Way

Conditions of snow and temperature vary so widely that it would be difficult to lay down rigid rules to govern the action to be taken by the section forces with respect to surface ditches during the winter and early spring. A basic rule, however, that always should be followed is that whenever there is a probability that any considerable quantity of water will have to be disposed of, the drainage ditches should be clear to insure that there will be no obstruction to its free flow.

Where the snowfall is comparatively light and alternate freezing and thawing are relatively frequent, there may be cases where considerable work on the ditches can be justified. On the other hand, there may be cases under similar conditions where it would require an unreasonably large force to keep the ditches open at all times. In sections where long cold spells are the rule it would be wasted effort to spend much time keeping the ditches clean, even though snow storms occur from time to time. I spent one winter on a division where the temperature did not rise as high as 32 deg. for 110 days. The snowfall for this period aggregated almost 60

in., and much useless expense would have been involved in keeping the ditches open prior to the spring thaws.

In another case with which I am familiar, there is a cut two miles long. A parallel intercepting ditch lies about 50 ft. back, and is generally effective in preventing water reaching the cut from above. But when it is filled with packed snow, a considerable volume of water from melting snow sometimes flows over it into the cut. Here, while the snowfall is rarely so heavy as in the foregoing case, it sometimes drifts badly and the rotary plow is required to open it up. During some winters little attention to the ditches is needed until spring, while during others I have known a good sized gang to be kept busy almost throughout the season.

These examples are given to illustrate the wide range of conditions that affect this question, and to indicate that no hard and fast rule can be applied, even to individual cases, because the conditions may be materially different in successive years. The local forces are usually experienced enough to know what should be done and, under proper supervision of course, should be given the necessary latitude to do it.

Steel or Wood Sash—Which?

What are the relative merits of steel and wood sash for enginehouses? For shops? Under what conditions should each be used?

Prefers Steel Sash

By Walton Johnson
Painter Foreman, Louisville & Nashville, Louisville, Ky.

Steel window-frames and steel sash are most satisfactory for use in both enginehouses and shop buildings. A steel sash in a steel frame never gets out of line and if kept well painted requires practically no maintenance. A wood sash in a wood frame is likely to give trouble during wet weather as a result of the swelling of the wood as it absorbs moisture. When this occurs, the sash cannot be raised or lowered. If, on the other hand, the sash is fitted so that it can be raised and lowered without difficulty during wet weather, it will dry out and shrink during dry weather until it is loose in the frame. In the latter case, the mitre and the sash rot within a few years and must be replaced. For these reasons, in the long run, wood sash is more expensive than steel. It has been my experience that once steel sash is installed, maintenance troubles practically disappear, provided it is kept well painted.

Each Has Its Place

By Frank R. Judd
Engineer of Buildings, Illinois Central, Chicago

Steel sash has practically replaced wood sash in shop buildings, as it is better adapted for the large glass areas so desirable in most buildings of this type. This is not the case in enginehouses, however, where its use has been limited because of the destructive effect of steam and gases on the metal. In general, wood sash gives much better service under the severe conditions imposed in enginehouses and has been the most satisfactory material available. Wood sash for this service should be designed with heavier muntins and stiles than the ordinary stock sash because of the large openings in which they are usually used, as well as better to withstand the severe conditions to which they are exposed, from both wind pressure and gases.

In some instances, treated sash and frames have been used to good advantage. More time is required to obtain them, however, for after the sash and frames have been made they must be shipped knocked down to the treating plant and then either returned to the mill to be assembled or sent direct to the job for assembly at the site. No one questions that preservative treatment will materially increase the life of the sash and frames or that it is desirable, if time will permit it to be done. If treated, special consideration must be given to painting, for in some cases special paints will be required to cover the treated surfaces.

Objections to the use of steel sash in enginehouses are being overcome to some extent of late by the trend toward the use of galvanized steel, wrought iron, aluminum and alloys having high resistance to corrosion.

Advantages of Large Ties

What advantages, if any, are there in selecting the largest ties for joint ties? For use on curves?

A Word of Warning

By Henry Becker
Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

From long experience I always select the best of the ties on hand for use under joints, particularly for joints on curves. The low rail on a curve receives the most severe usage and should be given the best available support. I have always found it easier to main my curves if the joints are well supported. This is also true of tangents, but not quite in the same measure. Care should be exercised in making the selection, for very thick or very wide ties are a detriment rather than a benefit at any point under the rail, and this is more especially true under the joints, because such ties are difficult to tamp properly and sometimes lack adequate support.

Little Advantage

By T. M. Pittman
Division Engineer, Illinois Central, Water Valley, Miss.

In the early days of the railways, when most of the track was laid with even joints and the joint fastenings were weak, it was the universal custom to select the larger ties for use under the joints on the theory that they gave better support to the joint. At present, joint bars are stronger, approaching more nearly the strength of the rail, and it is the general practice to lay the rail with broken joints. This has led some roads to abandon the former tie spacing. These roads now space their ties uniformly without regard to the joints. This practice does not justify any expense to seg-

regate ties for the purpose of using the larger ones for the joints or on curves.

In the general run of ties, however, some that are oversize will always be found and a good foreman will invariably select the largest ties he has for use under the joints. This is about as much expense as can be justified for making this selection. If, however, these larger ties should be very much thicker than those removed, the old tie beds must be broken, which may lead to churning and thus be a disadvantage. The same situation exists with respect to ties on curves. Under present conditions of track construction and maintenance, the cost of segregating the largest ties for curves cannot be justified.

7 In. by 9 In. the Limit

By R. L. Sims

District Maintenance Engineer, Chicago, Burlington & Quincy, Galesburg, Ill.

Whether special selection of ties for joints and curves should be made will depend on the class of tie in use. If the ties available are not uniform in size, the best ties should be selected for use at joints and on curves, but they should not be larger than 7 in. by 9 in. in section. With this size more effective tamping can be done than if they are wider or deeper, and this is an important factor in good maintenance. If the ties are too large it is difficult to get the ballast well tamped under them and they will lack adequate roadbed support.

Joints Are Weak Spots

By J. Morgan

Retired Supervisor, Central of Georgia, Leeds, Ala.

Joints are the weakest points in the track, although great strides have been made in recent years to strengthen them. Years ago it was the rule to select the largest ties for joints, but we had no special grade for curves although this would have been an advantage. Today, with the close tolerances on tie dimensions there is very little difference between the largest and the smallest ties, provided the inspection is in accordance with specifications. If, however, there are some oversize ties, I would place them under the joints, but there is no warrant for making a segregation for curves. On the other hand, hardwood ties should be used on curves in preference to softwood ties.

Protecting from Locomotive Gases

What satisfactory methods can be employed to protect overhead structures from the effects of locomotive gases?

Encasement Best

By G. A. Haggander

Bridge Engineer, Chicago, Burlington & Quincy, Chicago

One widely used and very satisfactory method of protecting steel overhead structures on new work is to encase in concrete the steel members subject to locomotive blast, using blast plates freely to prevent erosion and deterioration of the concrete directly over the track. Unfortunately, however, there are many old structures that lack this form of protection, and they must be maintained to the best advantage as long as they remain fit for service. In 1931, the Burlington issued the following instructions for protecting structures of this type:

"On overhead highway bridges, viaducts and railroad bridges over tracks, where blast and gases from locomotives seriously affect the steelwork, the following method shall be used for painting the affected portions:

"After thoroughly cleaning the steel, paint it with one coat of approved red lead, mixed in the proportions of

28 lb. red lead (dry)
1 gal. raw linseed oil
½ pt. turpentine
½ pt. dryer

"After this coat has dried, apply a second coat of the same paint, and as soon as it becomes tacky, blow or throw fine sand against it. The sand should not be blown too far into the paint, but just enough to embed it. After the paint has set, apply two wash coats of cement and sand, mixed in the ratio of 1 to 3, allowing the first coat to dry before the second one is applied. These wash coats of grout will adhere to the sand and will keep the linseed oil in the paint under them in a rubbery condition and give protection to the paint."

We have found in many cases that paint applied in the usual way will not last one year, but these applications have given four years of good service.

Nothing Fully Effective

By Division Engineer

This question touches one of the difficult problems confronting both designers and maintenance officers. No method that affords full protection has yet been devised, but considerable advance has been made in recent years. Paint applied to steel surfaces, the principal method used for years, is almost completely ineffective. With the development of concrete encasement of steel, there was considerable improvement, but it was soon learned that concrete directly over the locomotive stack was eroded and that on either side and in pockets was softened and failed. Blast plates seemed to be the answer to the erosion problem, but early attempts at the use of blast plates failed, in some cases because steel was used and in others because of faulty methods of securing them. Today, with denser concrete, blast plates of cast or wrought iron and adequate hangers, the problem has been considerably simplified and is less serious than formerly.

This does not solve the problem of the older structures which must be maintained, some of them for years, but which are too light to allow the application of concrete decks and concrete encasement. In both these older structures and in designs for new ones, all pockets where gas can collect should be eliminated or avoided. Cover plates of wrought iron and the installation of blast plates where clearances will permit will be of real help. After this has been done periodic cleaning and painting with paint that offers the greatest resistance to locomotive gases are about all that can be done.

Where concrete arches or slabs are to be built over tracks, special care should be exercised to obtain concrete of high density. Aggregates capable of resisting the effect of locomotive gases should be chosen, and blast plates of wrought iron should be placed over the tracks. Every effort should be made to eliminate pockets where gases might collect.

NEWS of the Month

Hearings on Rate Case Near Conclusion

Following regional hearings on the plea of the railroads for a 15 per cent increase in freight rates, which were conducted in six cities, members of Interstate Commerce Commission returned to Washington on January 17 for final sessions devoted to the testimony of protestants. Oral argument began on January 31, and briefs will be filed on February 9.

Motor-Carrier Hours Prescribed by I. C. C.

A 60-hour maximum week, or not more than 70 hr. in any period of 8 consecutive days, and a daily limit of 15 hours "on duty" and 12 hr. "at work" in any period of 24 consecutive hours for drivers of common and contract motor carriers were fixed by the Interstate Commerce Commission in a ruling which will become effective on July 1. These regulations were based on safety considerations, after investigations disclosed that hours so long as to be inherently dangerous exist in the trucking industry and to a lesser extent in bus transportation.

Two More Streamlined Trains for the Santa Fe

Two streamlined, stainless-steel, Diesel-drawn trains will be placed in operation between Chicago and Kansas City, Mo., on April 1 by the Atchison, Topeka & Santa Fe. Each train will consist of seven cars, with a total seating capacity, including dining and lounge spaces for 300 passengers. The consist of each train will include one combination mail and baggage car, three chair cars, a combination lounge car, a dining car and a parlor car. The chair car seats will be rotating and reclining and each car will have a smoking room and lavatory for men and a dressing room and lavatory for women, with five seats in each.

Zephyrs Travel Four Million Miles

A total of 4,020,707 miles had been accumulated by the Zephyrs of the Chicago, Burlington & Quincy during the period from their inauguration to December 31. The Twin Zephyrs, operating between Chicago and the Twin Cities, had covered 1,665,538 miles; the Denver Zephyrs, between Chicago and Denver, 1,228,554 miles; the Pioneer Zephyr, between Lincoln and Omaha, 461,799 miles; the Sam Houston Zephyr, between Fort Worth and Houston, Tex., 257,116 miles; the Ozark Zephyr, between St. Louis and Kansas City, Mo., 209,878 miles; and the Mark Twain Zephyr between St. Louis and Burlington, 197,835 miles.

New Research Heads Appointed for A. A. R.

William I. Cantley mechanical engineer of the Lehigh Valley for 20 years, and G. M. Magee, assistant director of the division of engineering research of the Association of American Railroads, have been placed, respectively, in complete charge of research for the Mechanical and Civil Engineering divisions of the A.A.R., effective January 1. This work was formerly under the direction of L. W. Wallace, who retired on December 1 as director of the division of engineering research to become director of engineering and research of the Crane Company, Chicago. At the time of his appointment last fall as assistant director of the division of engineering research of the A.A.R., Mr. Magee was serving as an assistant engineer on the Kansas City Southern.

Roads Plan Fair Building

Progress in rail transportation will be shown dramatically at the New World's Fair of 1939 in the largest building of the entire exposition. Under the sponsorship of the 26 eastern carriers composing the Eastern Presidents' Conference, the railroads will join with the railway supply industry and railroad organizations of participating foreign countries in presenting a unified exhibit at an international exposition. The exhibits of this group, which will include models, dioramas and pictures, both still and moving, depicting the growth of the railroad industry, will be housed in a building 1,400 ft. in length and covering 150,000 sq. ft. of floor space, which will be dominated by a dome, 180 ft. in diameter and eight stories high. The dome will be devoted to a major theme of the exhibit program—a tribute to the actors in this drama of progress.

"Railroads on Parade" will be the theme of a proposed outdoor pageant to be presented before a grandstand seating 4,000 persons. Edward Hungerford, director of the Fair of the Iron Horse in 1927 and of the Wings of a Century at A Century of Progress in 1933-34, is in charge of the pageant. In a wing adjacent to the dome of the exhibition hall a complete railroad system will be set up in miniature to illustrate operating details. Space from which over 800 persons may view this model system at one time will be provided.

I. C. C. Annual Report

The enactment of legislation providing for the comprehensive regulation of interstate air transportation was urged in the fifty-first annual report of the Interstate Commerce Commission, which was submitted to Congress on January 3. In addition to other legislative recommendations, the commission took occasion to express its views concerning other matters of concern to railroads. For instance, while it conceded that price increases are "at times necessary" it went on to say that "no competitive industry can work out its salvation through a price-increasing policy alone, and the railroad industry is now, to a very considerable extent, in that class." While thus asserting that freight rate increases do not offer a solution to the problems of the railroads, the commission stated that its attitude in this connection is not to be taken as indicating any position in regard to the pending freight rate increase on which the commission has "an entirely open mind." Other matters covered in the commission's report included a discussion of the extensive use of passes and free tickets on the railroads, a résumé of the railroad security market, and a report on the progress of administering the act for the regulation of motor carriers.

Rail-Labor Accord in 1937 Lauded by Mediation Board

Events during the fiscal year ended June 30, 1937, have made it "strikingly clear" that the purpose of the Railway Labor Act is being accomplished, stated the National Mediation Board in its third annual report to Congress. "In a year outstanding for serious labor disputes resulting in plant shut-downs and cessations of operations, the railways and air lines have continued to serve the public without serious interruption," the document said. According to the report, the board reduced its accumulation of open cases during the fiscal year ended June 30, 1937, carrying over into the current year only 148 pending proceedings as compared to the 185 brought forward from the previous year ended June 30, 1936. The board's success in gaining on its backlog of cases was due to the services of an additional mediator authorized by Congress.

Association News

Maintenance of Way Club of Chicago

Fifty-nine members and guests attended the meeting at the Auditorium Hotel, Chicago, on January 24, when W. E. Fuller, assistant to executive vice-president, Chicago, Burlington & Quincy, presented an address on the Relationship between the Maintenance of Way and Operating Departments. At the next meeting, which will be held on February 28, T. T. Keliher, chief special agent of the Illinois Central, will speak before the club on the activities of railway special agents and the opportunities for co-operation on the part of the maintenance of way forces.

American Railway Engineering Association

Bulletin 401 containing the reports of nine committees was mailed on January 15, bringing the total number of reports now in the hands of members of the association to 24. All of the remaining reports are in the hands of the secretary and will appear in Bulletin 402 which will be mailed about February 15, and which will contain, in addition to seven committee reports, a monograph by O. E. Selby on Net Section in Riveted Members.

Preparations for the thirty-ninth annual meeting of the association, which will be held at the Palmer House, Chicago, on March 15, 16 and 17, are rapidly nearing completion. The Committee on Arrangements held one meeting in January and will hold another on February 1 to perfect plans, in co-operation with Assistant Secretary McNellis, that will insure the most expeditious conduct of the convention. Continuing the plan followed at the last two conventions, the committee is preparing a program booklet which will be mailed to all members about February 15, which, in addition to the complete program for each session of the convention, will contain a synopsis of all committee reports and a further announcement of the exhibit of the National Railway Appliances Association.

Plans for the convention include the conferring of honorary membership on four past presidents of the Association, including C. A. Morse, retired chief engineer, Chicago, Rock Island & Pacific; J. G. Sullivan, retired chief engineer, Canadian Pacific; J. L. Campbell, retired chief engineer, Northwestern Pacific; and W. B. Storey, retired president, Atchison, Topeka & Santa Fe. This ceremony is scheduled to take place at 10 a.m. on Tuesday, March 15, and will be followed by an address by J. M. Symes, vice-president, A.A.R.

A luncheon will be held on Wednesday, for members of the association and of the National Railway Appliances Association, at which Charles Donnelly, president of the Northern Pacific, will be the speaker.

An invitation to attend the convention has been extended to a party of German engineers who expect to be in this country on a study tour at about the time of the meeting. Present information indicates that they will be present.

Preliminary to their work for 1938, four committees held meetings in January as follows: Yard and Terminals at Newark, N. J., on January 17 and 18; Track, at Chicago, on January 18; Masonry, at New York, on January 18 and 19; and Buildings, at Chicago, on January 20. Only one committee, Iron and Steel Structures, has a meeting scheduled for February. This committee will meet at Chicago on February 3 and 4.

Wood-Preservers' Association

More than 350 men attended the thirty-fourth annual convention at Chicago on January 18-20, over which H. R. Duncan, superintendent timber preservation, C. B. & Q., presided. As heretofore, consideration was given principally to the revision and synchronism of specifications for preservatives and for the treatment of timber and to the review of service records.

At the Users' Day session on Wednesday morning, C. J. Geyer, engineer maintenance of way, C. & O., presented a paper on The Preframing of Timber Before Treatment for Use in Bridges and Buildings, and R. H. Ford, chief engineer, C. R. I. & P., spoke on the Rock Island's Observations in the Use of Treated Cross Ties. At the session on Tuesday evening, Dr. Hermann von Schrenk, consulting timber engineer, N.Y.C. Lines, spoke on Termites in Buildings. Abstracts of the first two papers appear on preceding pages in this issue, while Dr. von Schrenk covered, in the main, the same ground as in an address before this association at Houston, Tex., in 1934, which was abstracted in *Railway Engineering and Maintenance* for May, 1934.

The following officers were elected for the ensuing year: President, B. M. Winegar, Canada Creosoting Company, Montreal, Que.; first vice-president, C. S. Burt, superintendent ties and treatment, I. C., Grenada, Miss.; second vice-president, Ralph E. Meyers, sales manager, International Creosoting & Construction Company, Galveston, Tex.; treasurer, H. L. Dawson, Washington, D. C. (re-elected). W. R. Arnold, chemical engineer, Wood Preserving Corporation, Orville, Ohio, and W. R. Goodwin, engineer wood preservation, Soo Line, Minneapolis, Minn., were re-elected members of the Executive committee. Washington, D. C., was selected as the 1939 convention city.

Roadmasters Association

W. O. Frame (C.B. & Q.), president, has appointed the following members to serve on committees to study and report at the convention next September as follows:

The Maintenance of Line and Surface to Meet Present Day Operating Requirements; E. L. Potarf (chairman), dist. engr., C.B. & Q., Omaha, Neb.; A. L. Kleine (vice-chairman), rdm., A.T. & S.F., Marceline, Mo.; C. C. Clark, rdm., S.P., Ogden, Utah; M. Donahoe, div. engr., Alton, Bloomington, Ill.; M. Coffel, supvr., C. & E.I., Momence, Ill.; C. J. Jaeschke, div. engr., M.P., Little Rock, Ark.; P. F. Muller, rdm., C. & W.I., Chicago; G. B. McClellan, dist. rdm., T. & P., Marshall, Tex.; J. H. Dunn, rdm., N.Y.C. & St.L., Ft. Wayne, Ind.; F. G. Walter, asst. engr., I.C., Chicago, J. J. Clutz, supvr., Penna, Trenton, N. J.; H. E. Durham, rdm., K.C.S., Pittsburg, Kan.; R. T. Rumbold, supvr. b. & b., Southern, Greensboro, N. C.; R. L. Guy, rdm., A.C.L., Thomasville, Ga.; J. B. Martin, gen. insp. of track, N.Y.C., Cleveland, Ohio; W. H. Haggerty, supvr., N.Y.N.H. & H., New York; J. A. Cherwinker, rdm., C.M.St.P. & P., Perry, Iowa; G. S. King, supvr., Sou., Branchville, S.C.

The Materials and Equipment for the Section Gang of Today; M. D. Carothers (chairman), div. engr., Alton, Bloomington, Ill.; W. F. Monahan (vice-chairman), gen. track insp., S.P., San Francisco, Cal.; C. E. Morgan, supvr. work equipt., C.M. St.P. & P., Chicago; S. W. Payson, rdm., St. L.S.F., Enid, Okla.; R. D. Copeland, rdm., A.A., Owosso, Mich.; J. F. Beaver, supvr., Sou., Greenville, S.C.; R. E. Meyer, rdm., C. & N.W., Mason City, Iowa; Chas. Pfeifer, supvr., E.J. & E., Joliet, Ill.; E. J. Brown, rdm., C.B. & Q., Chicago; W. H. Sparks, gen. insp. track, C. & O., Russell, Ky.; J. H. Morgan, engr. m. of w., F.E.C., St. Augustine, Fla.; D. Maconi, supvr., N.Y.N.H. & H., Franklin, Mass.; I. F. Schram, engr. m. of w., Erie, New York; M. H. Dick, associate editor, *Railway Engineering and Maintenance,* Chicago; M. C. Taylor, supvr., L. & N., Latonia, Ky.; M. D. Clark, rdm., S.A.L. Raleigh, N.C.; H. H. Britton, supvr., N.Y.C., Adrian, Mich.; D. T. Barksdale, rdm., I.G.N., San Antonio, Tex.; F. B. LaFleur, rdm., S.P., Lafayette, La.

Methods of Instructing Track Men in Safety; F. E. Schaumberg (chairman), rdm., C. & N.W., West Chicago; G. M. O'Rourke (vice-chairman), dist. engr., I.C., Chicago; J. G. Gilley, supvr., C. & O., Martin, Ky.; H. W. Stenson, gen. supv. m. of w., Me. Central, Portland, Me.; T. N. Turner, rdm., M.P., Newport, Ark.; C. R. Schoenfield, rdm., C.B. & Q., Aurora, Ill.; G. P. Palmer, engr. maint. and const., B. & O.C.T., Chicago; G. L. Griggs, rdm., C.B. & Q., Hannibal, Mo.; Jack Stewart, rdm., S.P., Phoenix, Ariz.; J. T. Cothran, supvr., Sou., Batesburg, S.C.; M. R. Palmer, rdm., A.T. & S.F., Las Vegas, N.M.; A. Chinn, ch. engr., Alton, Chicago; G. E. Boyd, associate editor, *Railway Engineering and Maintenance,* Chicago; C. D. Parker, supvr., L. & N.E., Pen Argyl, Pa.; B. E. Haley, gen. rdm., A.C.L., Lakeland, Fla.; C. W. Baldridge, asst. engr., A.T. & S.F., Chicago; R. L. Fox, supvr. b. & b., Sou., Richmond, Va.

The Maintenance of Turnouts; F. J. Liston (chairman), rdm., C.P., Montreal, Que.; L. M. Denney (vice-chairman), supvr., C.C.C. & St. L., Indianapolis, Ind.; J. L. Baker, rdm., C.B. & Q., Wymore, Neb.; F. H. Masters, asst. ch. engr., E. J. & E., Joliet, Ill.; J. G. Sheldrick, res. engr., Soo Line, Minneapolis, Minn.; E. E. Young, div. engr., C.B. & Q., Hannibal, Mo.; I. D. Talmadge, rdm., N.Y.O. & W., Middletown, N.Y.; O. V. Parsons, asst. engr. N. & W., Roanoke, Va.; N. E. Peterson, C. & I.M., Springfield, Ill.; A. L. Pollock, rdm., A.T. & S.F., Los Angeles, Cal.; A. W. White, engr. track, C. & O., Richmond, Va.; F. L. Lemon, supvr.,

N.Y.C., Ashtabula, Ohio; H. Olson, rdm., C.P., Consul, Sask.; H. H. Gudger, rdm., M.P., Monroe, La.; M. King, rdm., W. & L.E., Brewster Ohio; D. R. McWilliams, supvr., B. & O., Clarksburg, W. Va.

The Programming of Track Work; S. J. Hale (chairman), rdm., N. & W., Roanoke, Va., G. L. Sitton (vice-chairman), ch. engr. m. of w., Sou., Charlotte, N.C.; R. L. Sims, dist. engr. maint., C.B. & Q., Galesburg, Ill.; E. L. Banion, rdm., A.T. & S.F., Independence, Kan.; L. E. Thornton, asst. div. engr., Alton, Bloomington, Ill.; L. L. Smith, rdm., C.B. & Q., Burlington, Iowa; A. G. Reese, rdm., C. & S., Trinidad, Colo.; M. J. Lucy, supvr., D. & H., Plattsburg, N.Y.; C. T. Mulcahy, rdm., S.P., Bakersfield, Cal.; A. R. McEachern, rdm.-trm., S.P., Mina, Nev.; W. C. Radford, supvr., Sou., Keysville, Va.; H. E. Kirby, asst. engr., C. & O., Richmond, Va.; N. D. Howard, eastern editor, *Railway Engineering and Maintenance*, New York; A. W. Wehner, rdm., S.P., Lake Charles, La.; J. D. Sullivan, rdm., C. & N.W., Chicago; C. N. Gilmette, supvr., N.Y.N.H. & H., Cranston, R.I.; T. A. Gregory, rdm., N.P., Fargo, N.D.

The Elimination of Train Derailments Resulting from Track Defects; P. L. Koehler (chairman), asst. div. engr., C. & O., Russell, Ky.; J. M. Miller, (vice-chairman), div. engr. m. of w., Cumberland, Md., D. E. Lynch, rdm., C.B. & Q., Sheridan, Wyo.; O. R. McIlhenny, rdm., T.C.I. & R., Birmingham, Ala.; T. F. Donahoe, supvr., B. & O., Pittsburgh, Pa.; C. W. Ayling, rdm., A.T. & S.F., Chaute, Kan.; J. N. Woodell, rdm., A.C.L., Jacksonville, Fla.; H. C. Fox, supvr., Sou., Emporia, Va.; J. J. Van Bockern, rdm., C.M.St.P. & P., Savanna, Ill.; J. L. Hamilton, div. engr., Soo Line, Minneapolis, Minn.; R. C. Hager, supvr., N.Y.C., Kentland, Ind.; J. C. Jones, rdm., C.P., Regina, Sask.; J. T. Stotler, rdm., N.P., Helena, Mont.; W. M. Anderson, rdm., S.A.L., Birmingham, Ala.; M. A. Johnson, rdm., Ill. Term., Alton, Ill.; F. C. Hajek, rdm., C. & N.W., Wall Lake, Iowa.

Bridge and Building Association

President C. Miles Burpee (D. & H.) and the members of the Executive committee have completed the selection of the personnel for the technical committees for the ensuing year and these committees are now actively undertaking work on their respective assignments. The committees are as follows:

Recent Developments in Field Methods in the Construction of Timber Trestles; C. L. Metzmaker (chairman), supvr. b. & b., C. & I.M., Springfield, Ill.; L. B. Byrd (vice-chairman), supvr. b. & b., M.P., Popular Bluff, Mo.; M. A. Berringer, b. & b. foreman, I.C., Baton Rouge, La.; C. N. Billings, supvr. b. & b., S.P., Ennis, Tex.; F. W. Hillman, asst. engr. m. of w., C. & N.W., Chicago; H. G. Johnson, dftsmn., C.M.St.P. & P., Chicago; I. D. S. Kelley, str. engr., National Lumber Mfrs. Assn., Chicago; A. L. McCloy, supvr. b. & b., P.M., Saginaw, Mich.; R. T. Rumbold, supvr. b. & b., Sou., Greensboro, N.C.; W. Walkden, bridge engr., C.N., Winnipeg, Man.; H. E. Wilson, gen. for. b. & b., A.T. & S.F., Las Vegas, N.M.

The Maintenance of Movable Bridges; A. E. Bechtelheimer (chairman), asst. bridge engr., C. & N.W., Chicago; J. L. Vogel (vice-chairman), bridge engr., D.L. & W., Hoboken, N.J.; L. B. Alexander, asst. bridge engr., M.C., Detroit, Mich.; F. W. Allen, gen. elec. for., N.Y.C., Albany, N. Y.; R. W. Cook, gen. bridge inspector, S.A.L., Norfolk, Va.; F. G. Elmquist, bridge insp., C.M.St.P. & P., Chicago; R. L. Fox, supvr. b. & b., Sou., Richmond, Va.; W. R. Ganser, mast. carp., Penna.-Reading Seashore Lines, Camden, N.J.; L. D. Garis, asst. gen. bridge insp., C. & N.W., Chicago; H. A. Gerst, asst. bridge engr., G.N., Seattle, Wash.; C. E. Horrom, mast. carp., Alton, Bloomington, Ill.; F. H. Masters, asst. ch. engr., E.J. & E., Joliet, Ill.; H. T. Rights, bridge engr., L.V., Bethlehem, Pa.; E. E. R. Tratman, Wheaton, Ill.

The Insulation of Railway Buildings; N. D. Howard (chairman), eastern editor, *Railway Engineering and Maintenance*, New York; T. P. Soule (vice-chairman), gen. supvr. b. & b., N.Y.C., New York; B. W. Guppy, engr. strs., B. & M., Boston, Mass.; F. H. Lehrman, bridge drftmn., C. & N.W., Chicago; J. H. McClure, b. & b. mast., C.N., Moncton, New Brunswick; T. D. McMahon, arch., G.N., St. Paul, Minn.; E. C. Neville, b. & b. mast., C.N., Toronto, Ont.; N. F. Podas, asst. engr., C.M.St.P. & P., Minneapolis, Minn.; E. L. Rankin, arch., G.C. & S.F., Galveston, Tex.; T. H. Strate, div. engr., C.M.St.P. & P., Chicago.

The Maintenance of Cinder Pits; C. A. J. Richards (chairman), mast. carp., Penna., Chicago; J. G. Sheldrick (vice-chairman), res. engr., Soo Line, Minneapolis, Minn.; E. E. Fobes, asst. supvr. b. & b., N.Y.C., Albany, N.Y.; G. H. Holmes, supvr. b. & b., M.P., Falls City, Neb.; A. C. Irwin, ry. engr., Portland Cement Assn., Chicago; W. G. Kemmerer, asst. engr., Penna., Chicago; F. Misch, bridge insp., S.P., Bakersfield, Cal.; J. H. Phillips, b. & b. mast., D. & H., Watervliet, N.Y.; James Pullar, asst. engr., C.N., Moncton, New Brunswick; W. J. Strout, supt. b. & b., B. & A., Houlton, Me.; M. P. Walden, asst. supvr. b. & b., L. & N., Evansville, Ind.

The Possibilities and Limitations of the Acetylene Cutting Torch; J. L. Varker (chairman), b. & b. supvr., D. & H., Carbondale, Pa.; R. W. Johnson (vice-chairman), asst. engr., C.M.St.P. & P., Chicago; Armstrong Chinn, chief engr., Alton, Chicago; M. H. Dick, associate editor, *Railway Engineering and Maintenance*, Chicago; W. J. Lacy, b. & b. supvr., M.P., St. Louis, Mo.; K. L. Miner, supvr. b. & b., N.Y.C., Beacon, N.Y.; T. E. Snyder, mast. carp., B. & O., Salamanca, N.Y.; C. W. Wright, mast. carp., L.I., Jamaica, N.Y.

Meeting Today's Demands with Cranes and Pile Drivers; O. W. Stephens (chairman), b. & b. supvr., D. & H., Watervliet, N.Y.; F. H. Cramer (vice-chairman), asst. bridge engr., C.B. & Q., Chicago; C. W. Boyce, supvr. b. & b., Y. & M.V., Vicksburg, Miss.; V. S. Brokaw, asst. engr., C.M.St.P. & P., Chicago; J. A. Doyle, b. & b. mast., D. & H., Oneonta, N.Y.; J. S. Hancock, bridge engr., D.T. & I., Dearborn, Mich.; C. S. Heritage, bridge engr., K.C.S., Kansas City, Mo.; C. T. Kaier, gen. bridge insp., D.L. & W., Hoboken, N.J.; L. R. Lamport, supvr. work equip., C. & N.W., Chicago; W. J. Martindale, bridge for., T.H. & B., Hamilton, Ont.; C. U. Smith, gen. mgr. & ch. engr., Board of Harbor Comms., Milwaukee, Wis.; J. J. Wishart, supvr. b. & b., N.Y.N.H. & H., Boston, Mass.

The Inspection and Preparation of Wood Surfaces for Painting; T. D. Saunders (chairman), asst. div. engr., C.N., Toronto, Ont.; G. E. Boyd (vice-chairman), associate editor, *Railway Engineering and Maintenance*, Chicago; G. S. Crites, div. engr., B. & O., Punxsutawney, Pa.; H. Cunniff, gen. painter for., D. & H., Watervliet, N.Y.; G. W. Henrie, b. & b. insp., C. & O., Okeana, Ohio; S. E. Kvenberg, asst. engr., C.M.St.P. & P., Chicago; O. R. McIlhenny, rdm., T.C.I. & R., Ensley, Ala.; L. E. Peyser, asst. arch., S.P., Stockton, Cal.; J. H. Pyle, for. b. & b., M.P., Falls City, Neb.; T. E. Vieth, supvr. b. & b., Sou., Louisville, Ky.; R. A. Whiteford, div. engr., C.M.St.P. & P., Ottumwa, Iowa.

Pipe Lines for Railway Water Service; R. E. Dove (chairman), asst. engr., C.M.St.P. & P., Chicago; B. R. Meyers (vice-chairman), asst. div. engr., C. & N.W., Sioux City, Iowa; U. S. Attix, gen. fire insp., S.P., San Francisco, Cal.; C. A. Bouton, asst. gen. for., N.Y.C., Ravena, N.Y.; J. H. Bugg, supvr. water ser., C.N., London, Ont.; W. Gilbert, ch. insp. water serv., C. & O., Richmond, Va.; A. M. Glander, ch. carp., C.M.St.P. & P., Mason City, Iowa; M. M. Killen, gen. for. b. & b., G.C. & S.F., Galveston, Tex.; C. R. Knowles, supt. water serv., I.C., Chicago; A. J. Reading, asst. engr., P.M., Detroit, Mich.; T. J. Sheehy, supvr. water serv. & p., D. & H., Plattsburg, N.Y.; H. E. Thompson, b. & b. supvr., D. & H., Oneonta, N.Y.; L. C. Winklehaus, asst. engr., C. & N.W., Chicago.

N. R. A. A. Exhibit

Preparations for the twenty-seventh annual exhibit of the National Railway Appliances Association, which will be held at the International Amphitheatre, Chicago, on March 14-17, coincident with the convention of the American Railway Engineering Association, have now progressed to the point where an exhibit is assured that will equal or excel that of last year in the number of firms participating. To date, 79 companies have arranged for space, while additional applications are being received daily by C. H. White, secretary, 208 South LaSalle street, Chicago. With the newer and more modern facilities that will be provided in the International Amphitheatre this year and especially with the improved dining facilities that will be available, special efforts are being made, in cooperation with the A.R.E.A., to confine exhibits to the Amphitheatre, to the exclusion of exhibits and entertainment at the hotel. To enable railway men attending the convention to visit the exhibit with maximum convenience and minimum loss of time, the N.R.A.A. is providing continuous bus service between the convention headquarters at the Palmer House and the International Amphitheatre.

The companies which have already arranged to present exhibits are as follows:

Air Reduction Sales Co., New York
American Car & Foundry Co., New York

American Hoist & Derrick Co., St. Paul, Minn.
Armco Culvert Manufacturers Ass'n., Middletown, Ohio
Austin-Western Road Machinery Co., Aurora, Ill.
Barco Manufacturing Co., Chicago
Buda Co., Harvey, Ill.
Caterpillar Tractor Co., Peoria, Ill.
Chipman Chemical Co., Bound Brook, N. J.
Cleveland Tractor Co., Cleveland, Ohio
Clay Products Ass'n., Chicago
Crerar, Adams & Co., Chicago
Cullen-Friestedt Co., Chicago
Dearborn Chemical Co., Chicago
DeSanno & Son, Inc., A. P., Philadelphia, Pa.
Dickinson, Inc., Paul, Chicago
Dimick-Mosher Products Co., Boston, Mass.
Duff-Norton Manufacturing Co., Pittsburgh, Pa.
Eaton Manufacturing Co. (Reliance Div.), Massillon, Ohio
Elastic Rail Spike Corp., New York
Electric Tamper & Equipment Co., Ludington, Mich.
Evans Products Co., Detroit, Mich.
Fairbanks, Morse & Co., Chicago
Fairmont Railway Motors, Inc., Fairmont, Minn.
General Electric Co., Schenectady, N. Y.
Hayes Track Appliance Co., Richmond, Ind.
Hubbard & Co., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Johns-Manville Sales Corp., New York
Jordan Co., O. F., East Chicago, Ind.
Joyce-Cridland Co., Dayton, Ohio
Kalamazoo Railway Supply Co., Kalamazoo, Mich.
Lehon Co., Chicago
Letterman, Albert L., Chicago
Lewis Bolt & Nut Co., Minneapolis, Minn.
Locomotive Finished Material Co., Atchison, Kan.
Lundie Engineering Corp., New York
Maintenance Equipment Co., Chicago
Mall Tool Co., Chicago
Master Builders Co., Cleveland, Ohio
Mercury Manufacturing Co., Chicago
Metal & Thermit Corp., New York
Morden Frog & Crossing Works, Chicago
National Aluminate Co., Chicago
National Carbide Corp., New York
National Lock Washer Co., Newark, N. J.
Nordberg Manufacturing Co., Milwaukee, Wis.
Oxweld Railroad Service Co., Chicago
P. & M. Co., Chicago
Pease Co., C. F., Chicago
Pettibone Mulliken Co., Chicago
Philadelphia Steel & Wire Corp., Philadelphia, Pa
Pocket List of Railroad Officials, New York
Q & C Co., New York
Rail Joint Co., New York
Railroad Accessories Corp., New York
Rails Co., New Haven, Conn.
Railway Engineering and Maintenance, Chicago
Railway Maintenance Corp., Pittsburgh, Pa.
Railway Purchases and Stores, Chicago
Railway Track-Work Co., Philadelphia, Pa.
Ramapo Ajax Div. American Brake Shoe & Foundry Co., New York
Reade Manufacturing Co., Inc., Jersey City, N. J.
Republic Steel Corp., Cleveland, Ohio
Schramm, Inc., West Chester, Pa.
Sika, Inc., New York
Snow Construction Co., T. W., Batavia, Ill.
Sperry Products, Inc., New York
Strand & Co., N. A., Chicago
Syntron Co., Homer City, Pa.
Teleweld, Inc., Chicago
Templeton, Kenly & Co., Chicago
Thompson & Co., Oakmont, Pa.
Timber Engineering Co., Washington, D. C.
U. S. Gypsum Co., Chicago
U. S. Wind Engine & Pump Co., Batavia, Ill.
Western Railroad Supply Co., Chicago
Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
Yale & Towne Manufacturing Co., Philadelphia, Pa.

I. C. C. Orders Stokers Installed on 3,500 Engines

Approximately 3,500 locomotives used in through service have been ordered equipped with automatic stokers by the Interstate Commerce Commission. The report of Commissioner McManamy, who handled the case, gave as reasons for the order the bad effects which firebox-glare has on the eyesight of firemen, the danger of firebox explosions or backfires, the hazard to health resulting from the exposure of firemen to extremes of temperature, the fatigue induced by handfiring, and the danger to employees and passengers that is presented by the possibility of collisions resulting because of the inability of firemen to keep a proper lookout ahead of the train.

Personal Mention

General

N. A. Link, roadmaster on the Canadian Pacific at Wilkie, Sask., has been promoted to assistant superintendent at Lethbridge, Alta.

John A. Schwab, division engineer of the Eastern division of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been promoted to superintendent of the Logansport division, with headquarters at Logansport, Ind.

George D. Brooke, formerly a division engineer on the Baltimore & Ohio, whose election to the presidency of the Chesapeake & Ohio was reported in the January issue, has also been elected president of the New York, Chicago & St. Louis and the Pere Marquette. On these two roads, as on the C. & O., he succeeds the late **William J. Harahan,** formerly chief engineer of the Illinois Central, whose death on December 14 was also reported in the January issue.

James D. Shea, formerly a roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, whose promotion to trainmaster with headquarters at Madison, Wis., was noted in the January issue, was born on June 29, 1908, at Ottumwa, Iowa, and was educated at Parsons college and Iowa University. While still in school he entered railway service, working for the Milwaukee during summer months and other short periods as a timekeeper and assistant foreman on extra gangs. On March 1, 1932, he was made general track foreman at Western avenue, Chicago, and was transferred to Minneapolis, Minn., on August 1, 1932. From January 15, 1934, to February 1, 1937, he served as roadmaster of the Iowa and Dakota division, with headquarters at Sheldon, Iowa. In February, 1937, he was assigned to special work for the operating department, being engaged in this work at the time of his recent promotion.

Engineering

Coincident with the consolidation of the Lehigh and Wyoming divisions of the Lehigh Valley into the Lehigh-Wyoming division, the position of division engineer at Wilkes-Barre, Pa., has been abolished, and **C. P. Terhune,** formerly division engineer at that point, has become assistant division engineer of the consolidated division, with headquarters, as before, at Wilkes-Barre.

F. L. Guy, division engineer of the Coast division of the Southern Pacific, with headquarters at San Francisco, Cal., has been promoted to engineer maintenance of way and structures of the Pacific Lines of this company, with the same headquarters, succeeding **P. T. Robinson,** who has retired. **T. W. Saul,** roadmaster at Fresno, Cal., has been promoted to division engineer of the Tucson division, with headquarters at Tucson, Ariz., succeeding **H. E. Stansbury,** who has been transferred to the Los Angeles divisions with headquarters at Los Angeles, Cal., to replace **J. B. Dawson,** who has been transferred to the Coast division to succeed Mr. Guy. **W. Riseden,** assistant division engineer at Bakersfield, Cal., has been promoted to division engineer of the San Joaquin division, with the same headquarters to succeed **F. A. Bordwell,** who has been transferred to the Western division with headquarters at Oakland Pier, Cal., to succeed **D. A. Porter,** who has retired. **L. E. Peterson,** roadmaster at Los Angeles, has been promoted to assistant division engineer at Bakersfield to succeed Mr. Riseden.

L. H. Hornsby, whose promotion to engineer of bridges of the Seaboard Air Line was reported in the January issue, was born, in Montreal, Que., on July 23, 1890, and received his education in the

L. H. Hornsby

public and high schools and McGill University. After service with the Structural Steel Company of Montreal, Que., the Grand Trunk and Toronto Terminal railroad, the Hydro-Electric Power Commission of Ontario and the Lackawanna Bridge Company of Buffalo, N. Y., Mr. Hornsby entered the service of the Seaboard on May 22, 1922, as draftsman in the bridge department at Norfolk, Va. Later he was appointed bridge designer and then became assistant engineer of bridges.

Page P. Wagner, whose promotion to division engineer of the St. Louis Terminal and Illinois divisions of the Missouri Pacific, and of the Missouri-Illinois railroad east of the Mississippi river, with headquarters at St. Louis, Mo., was reported in the January issue, has been with the Missouri Pacific since 1921. Born in Concordia, Kan., on December 6, 1894, he attended the University of Kansas as a member of the class of 1918. He spent the summer of 1917 as a rodman on the Missouri Pacific at Wynne, Ark., and during the war he served as a second lieutenant of engineers, U.S.A. In January, 1919, he became a metallurgist and engineer for the El Tigre Mining Company at El Tigre, Sonora. Re-entering the railway field in September, 1921, as an assistant extra gang foreman and timekeeper on the Missouri division of the Atchison, Topeka & Santa Fe, he went with the Missouri Pacific one month later and served as a rod-

man and instrumentman at various points. In April, 1925, he became a draftsman in the office of the engineer of design at St. Louis, being appointed assistant engineer of the Memphis division at Wynne in October of that year. After serving in the latter capacity at various points Mr. Wagner was appointed acting division engineer of the Wichita division on July 1, 1937, returning to the position of assistant engineer in September of the same year. He was holding this position at the time of his recent promotion to division engineer at St. Louis.

David T. Faries, assistant engineer on the Ann Arbor (a subsidiary of the Wabash), with headquarters at Owosso, Mich., has been transferred to Montpelier, Ohio, on the Wabash, succeeding **J. S. Dant, Jr.,** whose appointment as track supervisor is announced elsewhere in these columns. **E. W. Nixon,** assistant engineer on the Wabash at Moberly, Mo., has been named to succeed Mr. Faries at Owosso.

H. T. Hazen, chief engineer of the Atlantic region of the Canadian National, with headquarters at Moncton, N. B., has retired and **F. O. Condon,** office engineer, has been appointed acting regional chief engineer.

Mr. Hazen was born at Truro, N. S., on March 14, 1870, and began his railway career in 1889. He was appointed engineer maintenance of way of the Canadian National in 1917, with headquarters at Toronto, Ont. In 1920, he was appointed acting chief engineer, and in 1922, chief engineer, with headquarters at Toronto. Upon the formation of the National system in 1923, Mr. Hazen was appointed assistant chief engineer of the Central region, with headquarters at Toronto and in 1924 he was transferred to Montreal as assistant chief engineer of the system. He was appointed chief engineer of the Atlantic region on October 1, 1932, the position he held until his retirement.

H. T. Hazen

George W. Varnum, whose appointment as office engineer in the office of the chief engineer of the Coast lines of the Atchison, Topeka & Santa Fe at Los Angeles, Cal., was reported last month, was born on November 17, 1889, at Montgomery City, Mo., and graduated from Iowa State College, Ames, Iowa, in 1919, with an engineering degree. In October, 1910, Mr. Varnum entered the service of the Santa Fe as a chairman in the engineering department at San Bernardino, Cal., but left the service in September, 1917, to enlist as a private in the United States Army, where he was subsequently commissioned a second lieutenant and assigned to duty at Camp Humphreys, Va., being promoted to first lieutenant of engineers in September, 1918. On his discharge from the army, Mr. Varnum returned to the Santa Fe as a draftsman at Winslow, Ariz., and from June, 1922, until November, 1925, he was an assistant engineer on bridge design at Los Angeles, Cal., being promoted on the latter date to assistant engineer in the office of the district engineer at Los Angeles. On November 1, 1929, Mr. Varnum was promoted assistant division engineer at Needles, Cal., and on January 1, 1936, he was advanced to roadmaster at Kingman, Ariz. On September 1, 1936, he was transferred to San Francisco, as assistant division engineer of the San Francisco Terminal division, where he was located at the time of his recent appointment as office engineer at Los Angeles.

Track

J. S. Dant, Jr., assistant engineer on the Wabash, with headquarters at Montpelier, O., has been appointed track supervisor at Albia, Ia., succeeding **H. H. Holmberg.**

O. W. Thurston, a section foreman on the Atchison, Topeka & Santa Fe, at Springer, N. M., has been promoted to roadmaster, with headquarters at Albuquerque, N. M., to succeed **R. E. Knapp,** whose transfer to La Junta, Col., was reported in the January issue.

M. T. Abrahamson, a roadmaster on the Albreda subdivision of the Canadian National, has been transferred to the Ashcroft subdivision, with headquarters at Kamloops, B. C., to succeed **J. A. Leslie,** who has been transferred to the Albreda subdivision, with headquarters at Blue River, B. C., to replace Mr. Abrahamson.

George E. Baines, section foreman on the Canadian Pacific at Blairmore, Alta., has been promoted to roadmaster at Manyberries, Alta., succeeding **K. G. T. Edmundson,** who retired on December 31. **Ivor Ljunggren,** section foreman at Meyronne, Sask., has been promoted to roadmaster at Wilkie, Sask., succeeding **N. A. Link,** who has been advanced to assistant superintendent at Lethbridge, Alta., as reported elsewhere in these columns.

H. J. Willard, whose promotion to roadmaster of the Salt Lake division of the Denver and Rio Grande Western, with headquarters at Helper, Utah, was reported in the January issue, was born on February 6, 1901, at Omaha, Neb. Entering the service of the Union Pacific as a rodman in 1920, he left in August, 1926, to become an instrumentman for the D. & R. G. W. He has since held successively the positions of assistant engineer and junior valuation engineer, and became assistant roadmaster in May, 1936, which position he held until his recent promotion to roadmaster.

A. L. King, whose promotion to track supervisor on the Mobile & Ohio, with headquarters at Murphysboro, Ill., was reported in the January issue, has been with this company for more than 23 years. Born in Burkley, Ky., on April 7, 1918, Mr. King entered railway service as a section laborer for the M. & O. on July 20, 1914. In October, 1918, he was promoted to section foreman, in 1924 he was placed in charge of an extra gang, and on April 1, 1926, he became foreman of the Wickliffe, Ky., section. He held this position until his recent promotion to track supervisor at Murphysboro.

J. G. Gilley, supervisor of track of the Martin district of the Chesapeake & Ohio, with headquarters at Martin, Ky., has been transferred to Shelby, Ky., where he will have supervision over both the Martin and Shelby districts, which have been combined under the name of the latter. **O. C. Ewers,** supervisor of track of the Shelby district, has been transferred to the Paintsville district, at Louisa, Ky., succeeding **C. F. Edwards,** who has been transferred to the Columbus district with headquarters of Columbus, Ohio. Mr. Edwards succeeds **F. A. Matthews,** who has retired.

Thomas P. Culligan, whose retirement from the position of supervisor of track on the New York Central, at Corning, N. Y., after 54 years service, was announced in the December issue, was born on May 2, 1867, at Tioga, Pa. He started his railway career with the New York Central in March, 1883, as a section laborer at Lawrenceville, Pa., and in May, 1886, was promoted to section foreman. On January 1, 1890, he was promoted to assistant supervisor of track, with headquarters at Slate Run, Pa., and on January 1, 1892, he was again promoted to supervisor of track at Corning, where he remained until his retirement.

Ray B. Plowman, who has been appointed roadmaster on the Canadian Pacific, with headquarters at Empress, Alta., as reported in the December issue, was born on August 9, 1901, at Otranto, Iowa. He entered railway service with the Canadian Pacific on April 17, 1922, as a section laborer. On May 17, 1926, he was promoted to section foreman, with headquarters at Gull Lake, Alta., subsequently serving in the same capacity at Majestic, Alta., and Dalroy, and Cantuar, Sask., and Shackleton. His recent promotion to roadmaster at Empress became effective on December 1.

T. W. Kinsley, who has been appointed track and bridge and building supervisor of the New Orleans terminal (part of the Southern System), as reported in the November issue was born in 1895 at Cincinnati, Ohio, and first entered railway service on January 1, 1914, as an assistant on the engineering corps of the Cleveland, Cincinnati, Chicago & St. Louis. In 1916, Mr. Kinsley became connected with the Detroit, Toledo & Ironton as an assistant engineer. After five years with the D. T. & I., he entered the service of the Pittsburgh & West Virginia as a field draftsman, leaving this company in 1922, to accept a position with the St. Louis-San Francisco as a locating engineer. After two years with the Frisco, Mr. Kinsley went with the Wabash as a track supervisor, returning to the Frisco

in 1925, where he served as a locating and division engineer until 1929. In that year he went with the Cincinnati Union Terminal as a resident engineer, which position he was holding at the time of his recent appointment as track and bridge and building supervisor on the New Orleans Terminal.

J. R. Brosnan, who has been appointed track supervisor on the Mobile division of the Southern, at Selma, Ala., as reported in the November issue was born on November 10, 1908, at Albany, Ga., and graduated from the Georgia School of Technology in 1931. He entered railway service with the Southern on August 24, 1935, as a student apprentice on track work at Nicholasville, Ky. On March 1, 1936, he was transferred to a rail gang at Danville, Ky., and on August 1, 1936, he was transferred to a bridge gang which was located at Somerset, Ky. On March 1, 1937, Mr. Brosnan was advanced to assistant to the roadmaster at Somerset, where he remained until his recent promotion to track supervisor at Selma, which became effective on September 1.

George W. Eberhardt, whose retirement as track supervisor on the New York Central at North Tonawanda, N.Y., was noted in the January issue, was born on November 5, 1867, at Buffalo, N. Y., and began his railway career with the New York Central as a tallyman at Buffalo, on March 1, 1890. On September 1, 1893, he became a clerk in the maintenance of way department, at Buffalo, and on July 1, 1897, he was appointed an extra gang foreman at the same point. On March 1, 1901, Mr. Eberhardt was promoted to assistant supervisor of track, and on August 18, 1905, he was advanced to supervisor of track, with headquarters at Clearfield, Pa. On March 16, 1910, he was transferred to the Mohawk division, at West Albany, N. Y., and on April 1, 1917, he was transferred to North Tonawanda, where he was located until the time of his retirement.

Bridge and Building

Charles H. Land has returned to his duties as supervisor of bridges and buildings of the Colorado division of the Union Pacific, with headquarters at Denver, succeeding **A. A. Tuttle.**

Bird J. Howay has been appointed supervisor of bridges and buildings and water service on the Detroit-Grand Rapids division of the Pere Marquette, with headquarters at Grand Lodge, Mich., succeeding **J. P. Wood,** who has been granted a leave of absence.

As a result of the consolidation of the Lehigh and Wyoming divisions of the Lehigh Valley into the Lehigh-Wyoming division, as noted elsewhere in these columns, **J. S. Smith,** supervisor of bridges and buildings at Wilkes-Barre, Pa., has been appointed assistant supervisor of bridges and buildings at the same point.

H. A. MacLean, roadmaster on the Canadian Pacific at Drumheller, Alta., has been appointed master of bridges and buildings of the Calgary division, with headquarters at Calgary, Alta., to succeed **A. J. English** who has retired. It was erroneously reported in the December, 1937, issue that Mr. MacLean had been transferred to Calgary.

D. E. Wiltse, assistant master carpenter on the Baltimore & Maryland division of the Pennsylvania, has been appointed master carpenter of the Columbus division, effective January 1, to succeed **D. L. Rehmert,** who has retired. **D. A. Leisher,** a transitman in the office of the chief engineer of the Eastern region with headquarters at Philadelphia, Pa., has been appointed assistant master carpenter on the Baltimore and Maryland division, with headquarters at Baltimore, Md., succeeding Mr. Wiltse.

Joseph Hazelwood, assistant supervisor of bridges and buildings for the New York, Chicago & St. Louis, with headquarters at Frankfort, Ind., who has been promoted to supervisor of bridges and buildings with the same headquarters, as reported in the January issue, was born at Fish Springs, Tenn., on July 21, 1893. After attending the public schools at that point he entered railway service in September, 1914, with the Toledo, St. Louis & Western (now part of the Nickel Plate) as a bridge carpenter. In 1916, he was advanced to assistant bridge foreman, and became bridge foreman in May, 1922. He was promoted to assistant supervisor of bridges and buildings in September, 1936, which position he held until his recent promotion to supervisor of bridges and buildings, effective January 1.

Obituary

Frank J. Nevins, until recently valuation engineer of the Chicago, Rock Island & Pacific, died on January 10 of heart disease. Mr. Nevins retired on December 1, 1937, after 23 years' service with the Rock Island. Born at Denison, Tex., 68 years ago, Mr. Nevins was educated at

Frank J. Nevins

Texas A. and M. College. He entered railroading as a clerk in the operating department of the Missouri Pacific at Osawatomie, Kans., in 1898, later being transferred to the chief engineer's office at St. Louis. He came to the Rock Island in 1914 as chief clerk in the valuation department at Chicago, and was promoted to valuation engineer a few years later. Mr. Nevins was the author of "From Grant to Gorman," a history of the Rock Island lines, which he prepared in connection with the seventieth anniversary of that company in 1922.

Alexander P. Gest, who for 14 years was connected with the engineering department of the Pennsylvania as assistant engineer on several divisions, and who held the position of special agent at the time of his retirement in 1921, died at his home in Philadelphia, Pa., on January 22, at the age of 84.

Supply Trade News

General

W. L. Hartley, 7031 W. Wisconsin Avenue, Milwaukee, Wis., has been appointed representative for the State of Wisconsin and upper Michigan, for the **Bucyrus-Erie Company,** South Milwaukee. The Brooks-Payne-Osborne Equipment Company, distributors for the Bucyrus-Erie Company, and the Day Pulverizer Company, both of Knoxville, Tenn., have been consolidated to form **The Brooks Equipment & Manufacturing Co.**

Frank E. Aurand, Jr., formerly associated with the **Concrete Surfacing Machinery Company,** Cincinnati, Ohio, has organized the **Aurand Manufacturing and Equipment Company,** with offices in that city, to take over the patent rights and manufacture of tools for cleaning metal and other rigid surfaces, heretofore in the hands of the Berg Cleaning Tool Division of the Concrete Surfacing Machinery Company.

Fairbanks Morse & Company opened its new offices at 600 South Michigan avenue, Chicago, on January 3, moving from 900 South Wabash, where it had been located for 30 years. The company has leased the first five floors of the building, formerly occupied by the International Harvester Company, and remodeled it. The first floor is occupied by a display room, the second by offices of the Chicago branch of the company, the third by the purchasing and traffic departments and the financing subsidiary, the fourth by the sales division offices, and the fifth by executive offices. Approximately 55,000 sq. ft. of floor space are being used.

Personal

Albert Reichmann, vice-president of the **American Bridge Company,** a United States Steel Corporation subsidiary, with headquarters at Chicago, retired on December 31. Mr. Reichmann was born on January 16, 1868, at Dubuque, Iowa, and received his engineering education at Grossherzoglich Badische Sechnische Hochschule, Karlsruhe, Germany. From October, 1890, to April, 1891, he was a draftsman for the Lassig Bridge & Iron Works, Chicago, resigning on the latter date to enter the employ of the American Bridge Works as a draftsman and computer. In November, 1894, he became assistant engineer in charge of the bridge

and building department of the Chicago, Milwaukee & St. Paul (now the Chicago, Milwaukee, St. Paul & Pacific), which position he held until 1901, when he re-entered the employ of the American Bridge Company as division engineer in charge of all engineering in its western division. On April 1, 1931, he was appointed chief engineer, with headquarters at Chicago, and in July, 1935, he was elected vice-president. In his engineering capacity, he has supervised the design of structural steel entering into ore docks at Duluth, Minn., and Two Harbors; of the Willamette river bridge at Portland, Ore.; the Thebes bridge over the Mississippi river; the bridge of the Atchison, Topeka & Santa Fe across the Mississippi river at Ft. Madison, Iowa; the Carquinez Straits bridge of the Southern Pacific in California; the Vicksburg bridge, the Cairo bridge and the Chicago Union station. He is a member of the

Albert Reichmann

American Society of Civil Engineers and served as a director from 1929 to 1931. He is also a member of the Western Society of Engineers and served as its treasurer from 1906 to 1913 and as its president from 1913 to 1914.

David F. Austin, manager of sales of the Chicago district of the **Carnegie-Illinois Steel Corporation,** has been elected vice-president in charge of sales, with headquarters at Pittsburgh, Pa., to succeed **C. V. McKaig,** who has been elected vice-president of the **United States Steel Corporation of Delaware,** which has recently been formed with headquarters at Pittsburgh, to supervise the management of subsidiary companies of the **United States Steel Corporation,** exclusive of public service subsidiaries and railroads. **J. Halsey McKown,** general manager of sales of Carnegie-Illinois, has been appointed assistant vice-president of the new organization.

Philip M. Guba, manager of sales at the Detroit district office of Carnegie-Illinois, has been transferred to Chicago to succeed Mr. Austin, and has in turn been succeeded by **Francis C. Hardie,** manager of sales of the Cleveland district. **F. Royal Gammon** has been appointed manager of sales of the Cleveland district to succeed Mr. Hardie. **Thomas J. Hilliard,** manager of sales of the Pittsburgh district, has been appointed general manager of sales at Pittsburgh, succeeding Mr. McKnown. Mr. Hilliard has been succeeded by **Thomas J. Bray, Jr.**

Mr. Austin's entire business career has been with the United States Steel Corporation subsidiaries. After leaving Colum-

David F. Austin

bia University in 1920, he spent seven years in the Youngstown district with the Carnegie-Land Company and the Conneaut Land Company. In 1927 he joined the Carnegie Steel Company's sales department in the Pittsburgh district and shortly thereafter he was transferred to Cincinnati, where, in May, 1931, he became assistant manager of sales. In November of the same year he became manager of sales at Cincinnati. Two years later he was appointed manager of sales of the Pittsburgh district office and in November, 1935, he was transferred to Chicago, where he became manager of sales of the Chicago district, the position he has held up to the present time.

Mr. Guba became associated with the Carnegie-Illinois Steel Corporation in

Philip M. Guba

March, 1933, as assistant manager of sales at the Detroit district sales office and was appointed manager of sales at that office in March, 1935. He has been connected with the selling end of the steel industry since 1910, having served 22 years with Jones & Laughlin, the Donner Steel Company, and the Republic Steel Corporation prior to his association with Carnegie-Illinois.

Mr. Hilliard was born at Pittsburgh on March 3, 1894. He attended St. Paul's School, Concord, N.H., and was graduated from Princeton University with an A.B. degree in 1917. From college, Mr. Hilliard entered the U.S. Army Air Service as a private in May, 1917, and subsequently was advanced to the rank of first lieutenant. He completed his army air service with the rank of captain in February, 1919. Mr. Hilliard was president of the Carhile Petroleum Company of Pittsburgh, from September, 1919, to January 1 1922; then president of the Pittsburgh Oil & Refining Co., serving in that capacity until 1926, and from January 1, 1926, until June 1 1930, he was president of the Waverly Oil Works Company Pittsburgh. From April 1931, to September, 1932, he was sales manager and vice-president of the O. Hammell Company Pittsburgh, and then to April, 1935 was vice-president of the Standard Steel Spring

Thomas J. Hilliard

Company, Cora, Pa. Mr. Hilliard joined the Carnegie-Illinois Steel Corporation as manager of sales of the Pittsburgh district office on January 1, 1936, and held this position at the time of his promotion.

Obituary

G. E. Braddock, assistant advertising manager of the Caterpillar Tractor Company, Peoria, Ill., died in Chicago on January 15 following a cerebral hemorrhage.

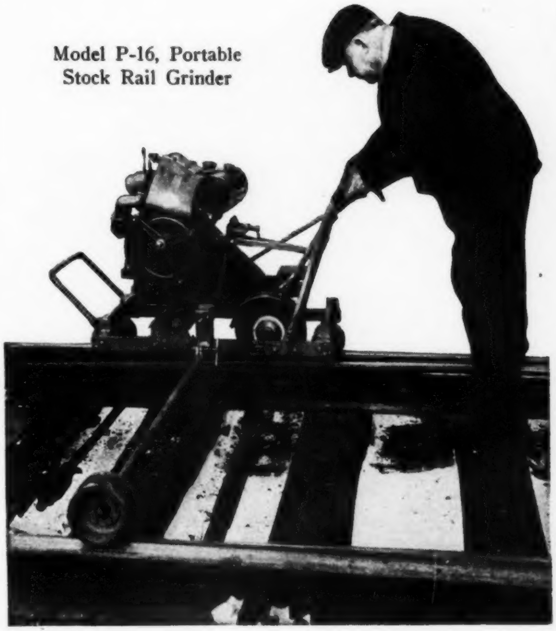
Trade Publications

Portable Electric Tools—The complete line of portable electric tools manufactured by Skilsaw, Inc., Chicago, is described and illustrated in a 50-page catalog, known as number 38, which is being distributed by this company.

Snow Removal—A group of four illustrated folders, featuring snow removal by means of Cletrac tractors equipped with various attachments, is being distributed by the Cleveland Tractor Company, Cleveland, Ohio.

Linde Distributors—The Linde Air Products Company, New York, has published a vest-pocket size booklet, listing the distribution, sales and service facilities of this company. The booklet also contains other pertinent information.

Model P-16, Portable Stock Rail Grinder



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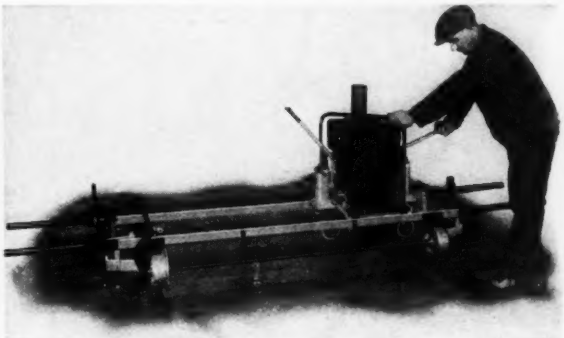

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